SEPTEMBER, 1944

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# TOOL & DIE JOURNAL

TOOLING AND PRODUCTION

*Long. Spiralling Chips*

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With these standard Putnam counterbores you get:

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TOOLS THAT
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HI-SPEED END MILLS
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ARMY (E) NAVY

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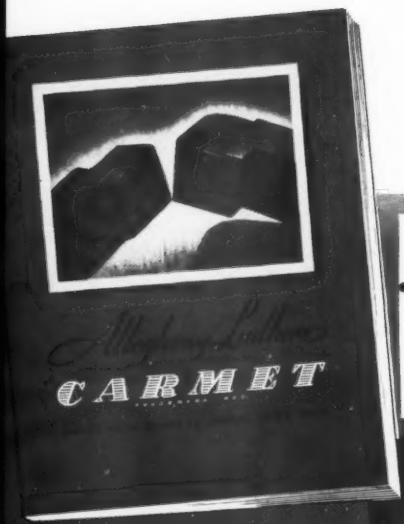
# An Important Addition . . . .

## TO OUR LINE OF

# Cutting Materials




Allegheny Ludlum STEEL CORPORATION

OUR research work has always been strongly identified with cutting materials. With the various high-tungsten types of High Speed Steels as the starting point, followed by the development of the "moly" types, Allegheny Ludlum technicians later originated the patented DBL low-tungsten analysis of High Speed Steel, which has played a major role in wartime tungsten conservation.

Years earlier, our Laboratories did much basic development work on carbides, when they were first introduced in this country. At that time, we registered the trademark "Carmet." Now, with the re-establishment of our Carbide Manufacturing Division, an advanced and complete line of Carmet carbide-tipped tools and carbide metal blanks is available, thoroughly researched and effectively enhancing Allegheny Ludlum's service to users of cutting materials. We invite your attention and inquiries.

*Send for your copy*

**Complete information and prices on Carmet Tools and Blanks, data on Tool Shank Steel, etc., in easy-to-follow tabular style.**

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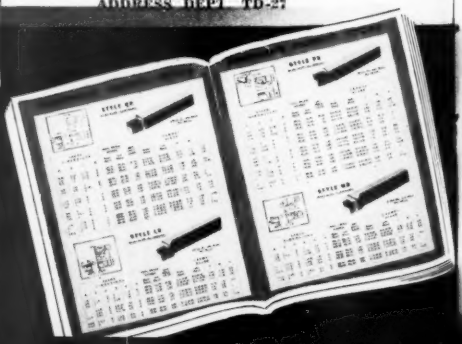

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## COLLET INDEX FIXTURES

**HARDINGE** Horizontal-Vertical Collet Index Fixture with Sub-Base and Tailstock for PRODUCTION WORK.

**SPECIFICATIONS:** Take standard 1" capacity 5C Hardinge Collets. Available with either a 20 or 24 hole hardened and ground index plate. The sub-base is 24½"x5⅛"

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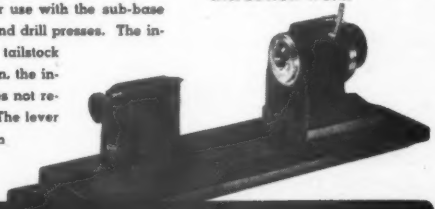

Time and again, you have experienced the need for a fixture to quickly hold work accurately and, at the same time, provide a means for indexing. **HARDINGE** Collet Index Fixtures fulfill those requirements economically and there is planned interchangeability of the various units for application to a wide variety of work.

These fixtures are for direct application or for use with the sub-base on your milling machines, grinders, shapers and drill presses. The index head shown above with sub-base and tailstock can be used in a horizontal or vertical position, the index plate has preselector screws so that holes not required for a particular job can be "blinded". The lever facilitates chucking of work on a production basis.

*Ask for complete bulletin.*

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**GEORGE J. HUEBNER • EDITOR, PUBLISHER**

**Technical Editor, E. WILLARD PENNINGTON** **Assistant Editor, PAUL L. REED**

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**The Tool & Die Journal is published monthly for those industry key men who are responsible for designing, building and using precision tooling**

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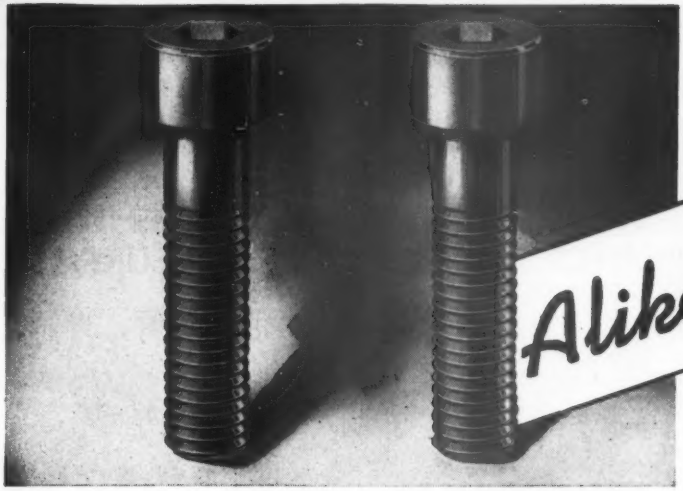


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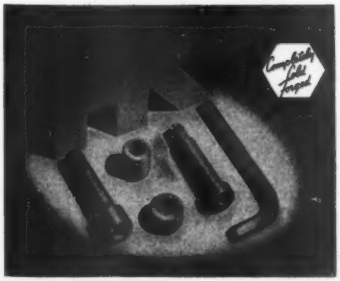


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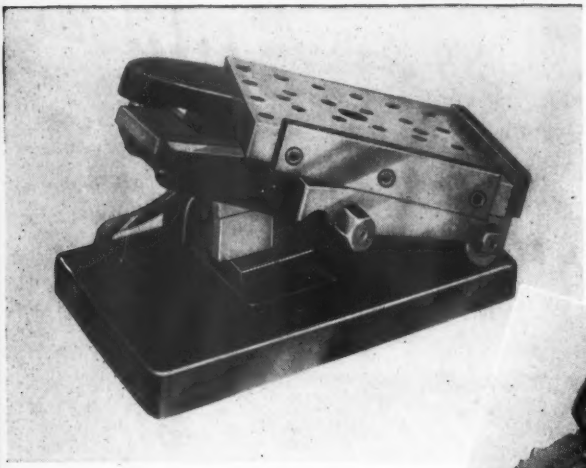

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**The Bellows Electroaire**

# POWER FEED UNIT

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**EASILY INSTALLED**

**HANDLES WIRE SIZE DRILLS**

**UNLIMITED VARIATION OF FEED AND RETRACTION SPEEDS**

**QUICKLY DISCONNECTED FOR MANUAL OPERATION**

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THE solenoid controlled Bellows Air Motor in the Electroaire Power Feed advances the drill, reamer or tap, at the touch of a foot switch, with perfectly controlled pressure and speed.

Speed of advance and retraction is independently controlled—may be regulated to suit tool or stock. Sensitive depth control permits close tolerances on blind drilling and tapping.

This balanced control of pressure and rate of feed permits higher spindle speeds and more accurate cutting . . . means faster production, fewer broken tools, fewer rejects. Operator effort is reduced to the point where one operator can frequently run two or more machines.

The Electroaire Power Feed unit is easily installed on standard drill presses.

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# COLLET CHUCKS

**Model "01" accurate within .0005 or less at the nose.** ★ **Model "02" accurate within .001 or less at the nose.**

The Erickson Precision Collet Chuck is outstanding for its super gripping strength and ability to maintain accuracy.

Erickson Engineers regularly solve problems for many types of manufacturers anxious to improve results and profit by savings through proper handling of work.

Uses and applications of the chuck to fit your requirements will gladly be recommended upon request.

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COLLAPSES 1/32" MAINTAINS GRIPPING STRENGTH and ACCURACY

High speeds and heavy feeds may be used, as the 8 point grip and extreme accuracy of concentricity avoid vibration and loosening.

**One Erickson Collet Replaces, at least, 7 Single Purpose Collets**

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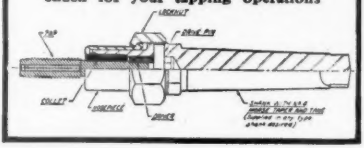
Uses an inverted adaptation of The Erickson Collet. Inquiries solicited for your requirements.

## *The* ERICKSON TAPPING CHUCK

An outstanding new development. Send for information covering this chuck for your tapping operations




**ERICKSON CHUCKS ARE STANDARD EQUIPMENT ON MANY MODERN MACHINES**

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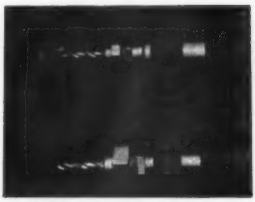
**ERICKSON STEEL CO. Dept. A**

# *mitting precision and accuracy* ★ ★ *from the machine to the job*

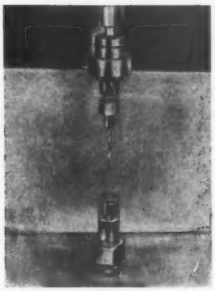
Model 201 High Speed Router Chuck with extended nose piece for pattern following.

Main and auxiliary turrets equipped with Erickson Chucks. Note short drill overhang, taps and reamers.

Model 102 Chuck—adapted for standard floating holder operations.



Models 102 and 402 Chucks in use on Automatic Screw Machine.

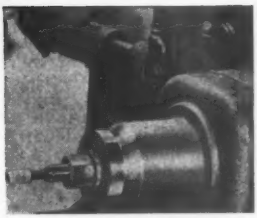


Model 301 Chuck adapted to quick change production operation on upper spindle. Note self-contained, interchangeable drill bushings in special nose piece on lower chuck.

Vertical Milling operation with 101 Chuck.

Horizontal Miller with 102 Chuck used to hold Woodruff Key Cutter.

**SEND FOR COPY OF BULLETIN "E"**



Model 301 Chuck designed for high speed internal grinding operations.

Model 201 used in drill press. Extra long drills can be used, by extending them from the chuck as they wear.

**2309 Hamilton Ave., CLEVELAND 14, OHIO, U. S. A.**

**Write for New Low Prices**

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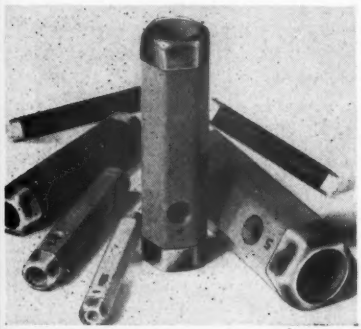

**Federal Taperlock Plastic Gage Handles have proved very satisfactory for glass gages. Being so much lighter than metal handles the danger of chipping and breaking is greatly reduced.**

**Plastic Handles insulate, protecting gages from bodily heat which might affect accuracy.**

**Easily marked for identification with the same tools used for marking metal handles. Available in SEVEN sizes—00 for small gages, 0, 1, 2, 3, 4 and 5. In FOUR colors — Red, Green, Yellow and Black.**

**IMMEDIATE DELIVERY**
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*The machine you helped design and prove in round-the-clock punishment of war production. Available for Quick Delivery!*

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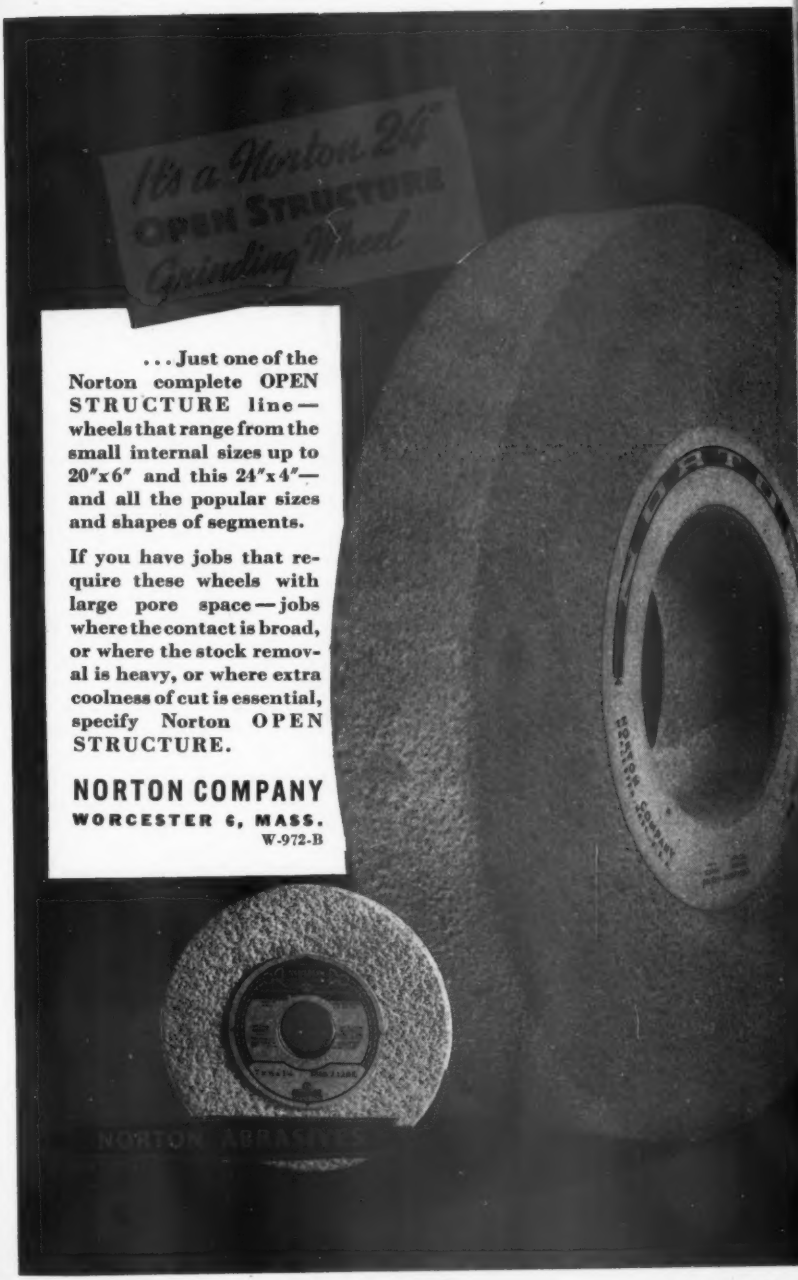
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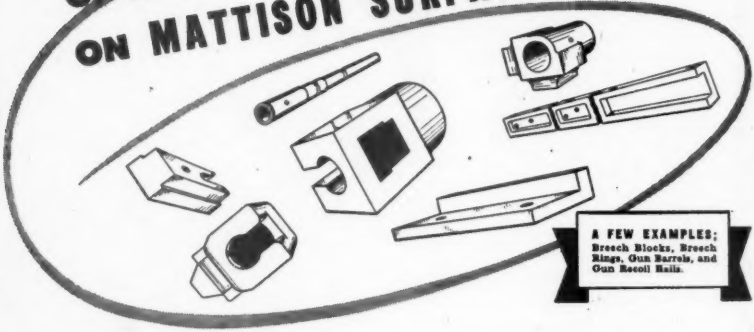
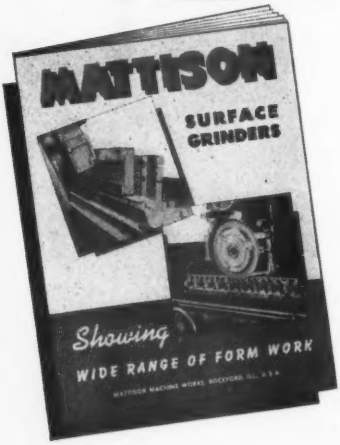


**A FEW EXAMPLES:** Breech Blocks, Breech Rings, Gun Barrels, and Gun Recoil Rails.




Through the use of special fixtures and contour dressing devices the above parts are all being ground on the Mattison High-Powered Precision Surface Grinder with a great saving of time and to extremely close limits of accuracy. These applications are important, not only from the standpoint of present production needs, but because they illustrate the unlimited capacity of Mattison Grinders over and above regular flat grinding. To you it opens up a new opportunity for grinding, a new opportunity for saving and a new opportunity for increasing production on work previously thought impossible to grind.

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*Available singly or in sets of 10 shapes*

***For Extremely Fine Work with Portable Power Tools***

Now to the standard line of Severance cutting tools has been added Midget Milling Cutters with ⅛" shanks for especially fine precision work. These efficient, longwearing, quick-cutting little tools have all the qualities of their big brothers in the Severance line. They cut sharp chips into the toughest metal, wood or plastic without chatter. They do a top-notch job of finishing on the most intricate patterns or parts. Available in ten standard shapes, singly or in sets of ten in an attractive, handy, colorful box that keeps them in neat order at all times.

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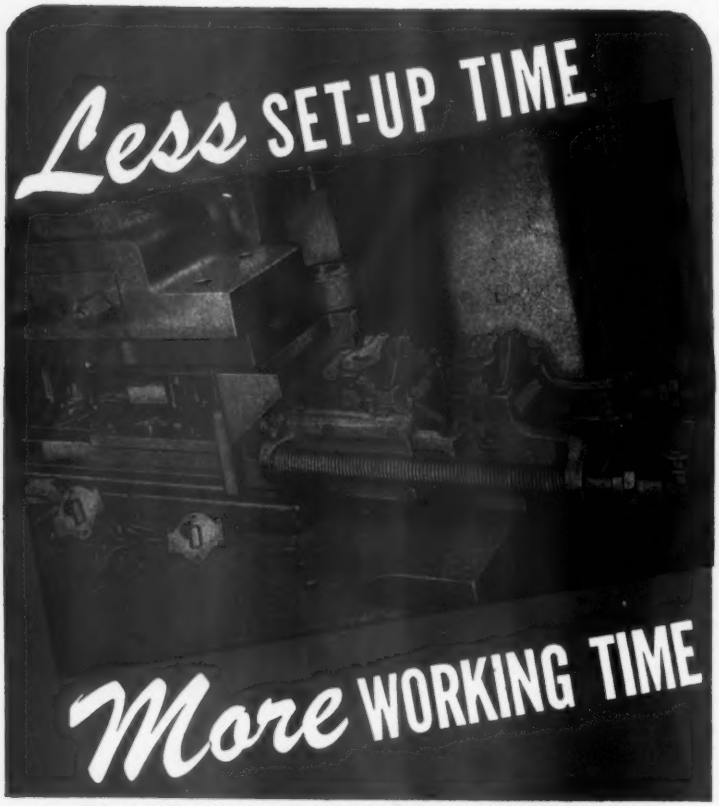


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LOOK FOR *this stamp of precision. It is your guarantee of a Turner Precision-made Gauge.*

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## or "Getting Off on the

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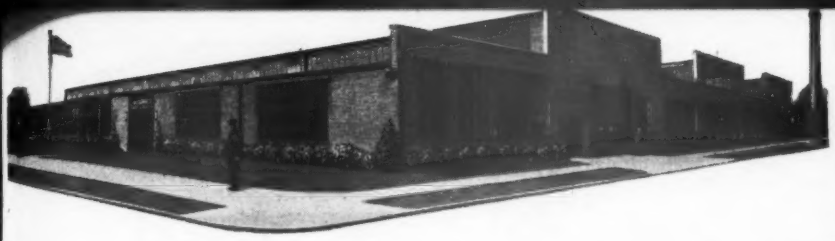

# in the RIGHT DIRECTION-

## *Right Foot"* with Tooling Problems

regularly serves the most exacting manufacturers—and enjoys a reputation for holding customers year after year.

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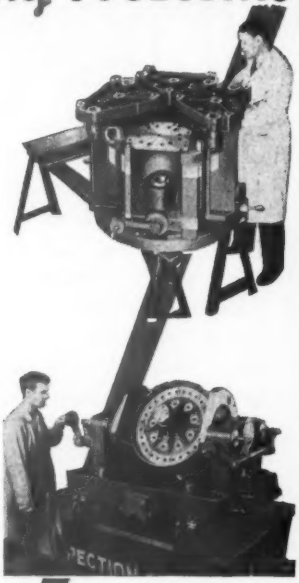
If you are not satisfied with the service or workmanship you are now getting write or phone McKINNEY—*Cleveland.*

It will be a "step in the right direction" that will "get you off on the right foot" in relation to your tooling problems.

If an illustrated list of our facilities and equipment will be of interest we will gladly send it.



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DESIGNERS and BUILDERS of PRECISION TOOLING
*Since 1920*

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*Tools-Dies-Jigs-Fixtures-Special Machinery*

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THE GRI[illegible] ESSENTIALS

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**Designed for tool room and laboratory work. And for precision finishes on regular production work, it's a natural.**

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**The tag shows the micro-inch finish the grinder will produce, according to the exacting Brush Analyzer Test.**

**Read the outstanding facts and specifications of this remarkable Surface Grinder and its auxiliary equipment —Magnetic Chuck, Selectron, Coolant Unit, Dust Collector, etc. Send for illustrated booklet today.**

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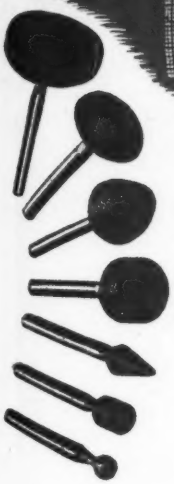


## Surface Analyzer Tape Proves You Get A Better Finish With Chicago Wheels

These results were obtained at a rate of 10 pieces per hour in an aircraft parts plant. Material, X-13-15, Rockwell 60 to 57, grinds out .006 to .007 stock. Chicago Wheel used, ½ x ½ x ⅛", Grain 180. Grade L Arcite FV Bond. Spindle Speed 40,000 r.p.m. Lapping and super finishing eliminated on this job.

Can you match that finish? Sounds phenomenal, but you can do it with Chicago Wheels. And, the secret of their superiority lies in the new FV Bond, developed exclusively for Chicago Wheels, after 50 years' experience making wheels for the most accurate and precise applications.

**Here's What FV Bond Will Do for You**

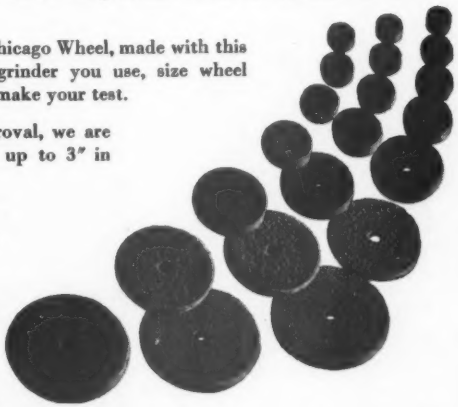
- Reduce your wheel costs.
- Produce a better finish without sacrifice of production time—a finish so smooth that you can measure it in micro inches.

### TRIAL WHEEL FREE

Write or send the coupon today for a Chicago Wheel, made with this remarkable new FV Bond. Tell us grinder you use, size wheel and kind of material on which you will make your test.

For the duration, with full WPB approval, we are specializing on small sizes — anything up to 3" in diameter.

Write for Catalog and one of the new Engineering Survey Forms, a step in the direction of better finishing.



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America's Headquarters for Mounted Wheels and Small Grinding Wheels

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Crucible Steel Co. of America
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☐ Please mail me your new 28-page book, "REXALLOY CUTTING TOOLS".

☐ We would like to discuss the possible use of REXALLOY in our plant.

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Chrysler Bldg., 405 Lexington Ave., New York 17, N. Y.
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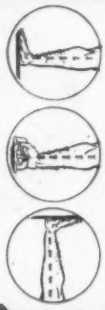
# MOVE "MOUNTAINS or MOLE HILLS"

## IN ANY DIRECTION



Here's *efficient power movement* to help you get maximum speed in your production... use T-J Air and Hydraulic Cylinders! Apply a T-J Cylinder to eliminate muscular effort or to simplify mechanical movements—the ideal way to clamp, press, raise or shift in any direction! Built in many styles, sizes and strokes to meet your requirements... exerting power movement of 100 lbs. to 12,000 lbs. (direct) with T-J Air Cylinders ... 1000 lbs. to 50,000 lbs. (direct) with T-J Hydraulic Cylinders. Easily and quickly installed. Write for latest catalogs.

FOR TOUGH JOBS SPECIFY

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RIVETORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHERS

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# AIRCRAFT RIVETING THE RIVITOR WAY

● T-J Air Powered RIVITOR brings speedy automatic feed riveting to aircraft production! Designed to handle exclusively aircraft (aluminum alloy) riveting... Production on the Rivitor depends on the individual application and requires no manual rivet handling. Operates with Air Squeeze action ... cost-cutting efficiency. Soundly engineered, sturdily built. On today's tough production lines, *T-J gets the O.K.!* Write for bulletin. The Tomkins-Johnson Co., Jackson, Michigan.

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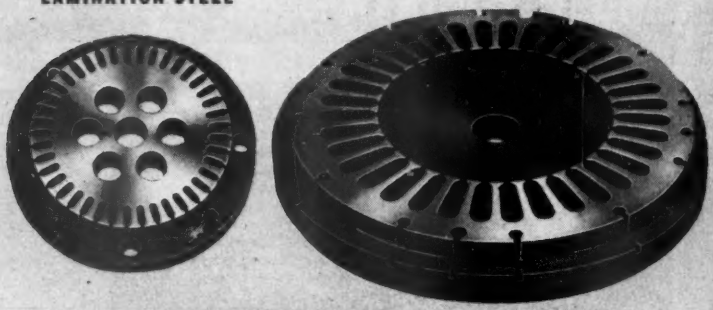
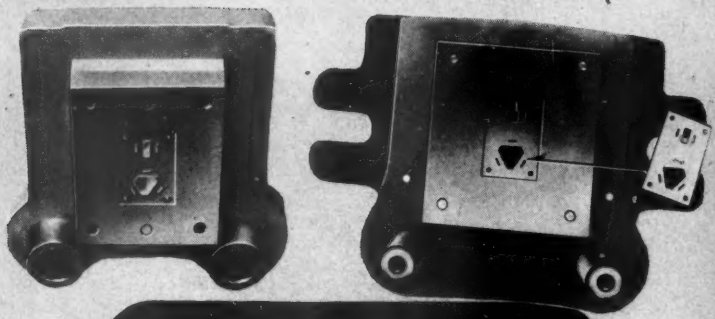


CROMOVAN
AIR-HARDENING DIE STEEL

FOR PUNCHING PLASTICS



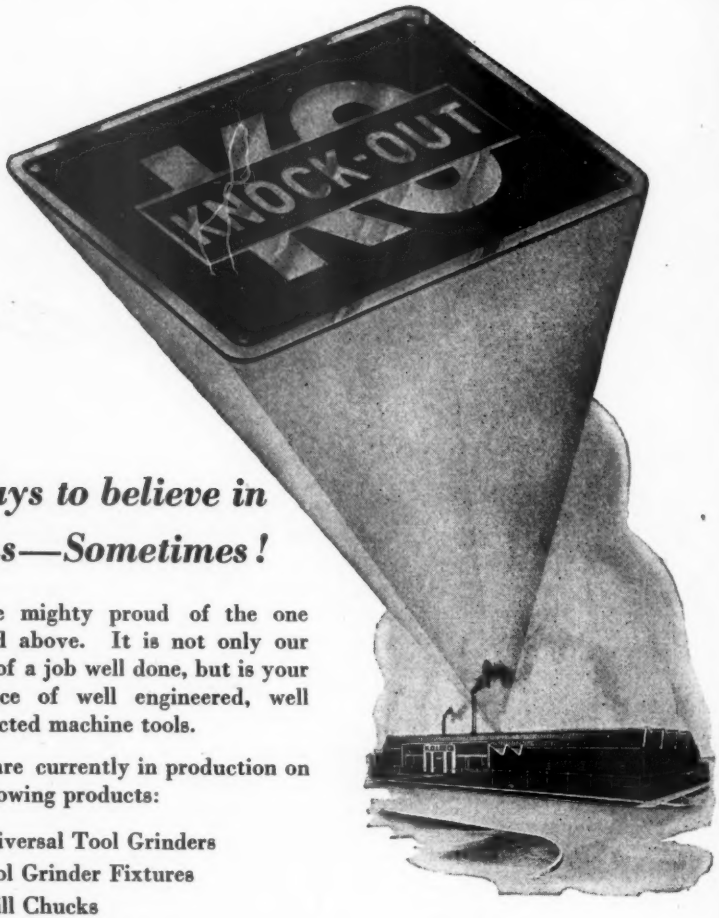
INVARO
OIL-HARDENING DIE STEEL

# BOTH have their places

**CROMOVAN FOR HIGH PRODUCTION**—Where the production desired is in the hundreds of thousands or millions of pieces, air-hardening Cromovan is used for dies because of its unusual depth of hardness and high resistance to abrasion. Cromovan's wearing and cutting capacity is several times that of regular oil-hardening die steels and considerably more than that of high-speed steel. Write for "Cromovan" Bulletin.

**INVARO FOR SHORTER RUNS**—Used for intermediate production runs, oil-hardening Invaro maintains close tolerances much longer than water-hardening carbon steels. Tools and dies made of Invaro can be used without grinding after heat treatment; possess uniform surface hardness; have excellent cutting properties; are tough and durable. Send for Invaro Bulletin "SL-2003."

**Firth-Sterling**
**STEEL COMPANY**




## *It pays to believe in Signs—Sometimes!*

We're mighty proud of the one pictured above. It is not only our stamp of a job well done, but is your assurance of well engineered, well constructed machine tools.

We are currently in production on the following products:

- Universal Tool Grinders
- Tool Grinder Fixtures
- Drill Chucks
- Expanding Mandrels
- A. C. Arc Welders
- Reamer Drives
- Abrasive Wheel Dressers
- Hand and Tool Post Grinders

*Literature on any or all products will be gladly sent to you on request.*

**K. O. LEE COMPANY**

Aberdeen, South Dakota

# FACTS

## ABOUT
## HARD CHROME PLATING

ONE of the principle advantages of chromium is its ability to resist corrosion.

However, it is sometimes true that chrome does not offer proper protection to the base metal itself due to its porosity. But, wherever this inadequate protection occurs, it is generally evident that the coating is too thin or the actual plating itself has been at fault.

It is obvious therefore, that a proper plating procedure cannot be overemphasized.

For example, the ability of Chromium to resist corrosion certainly could not be ignored as a protective coating for precision gage blocks . . . measuring accuracies in the millionths of an inch.

But the correct process of applying chromium to precision gages presented a major problem.

It was in 1937 that Elmer Ellstrom of the Dearborn Gage Company began to actively experiment with the practicality of finishing the gaging surface of Dearborn Gages with corrosion resistant chromium.

After exhaustive experiments the impossible was accomplished—Chrome was actually applied to precision gage blocks and without loss of accuracy in any manner.

This first major improvement in the manufacture of gage blocks brought to industry standards of measurements that would retain their true accuracies longer than any hard steel gage made; that is why Ellstrom-made gage blocks will last 2 to 5 times longer by actual test.

★ *This is number 2 in a series of articles by the Dearborn Gage Company on chromium plating.*

**DEARBORN GAGE CO.** 22035 BEECH STREET DEARBORN, MICHIGAN

*Originators of Chromium Plated Gage Blocks*

# POWER *IS* AS POWER *DOES!*

20" DRILL PRESSES —Bench and floor models. Hand or power feed. Spindle speeds 260 to 5200 r.p.m.

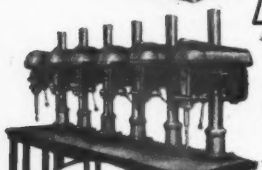
RADIAL DRILLS — Drill to center of 42" circle. Spindle speeds 160 to 4200 r.p.m.

METAL CUT-OFF MACHINES—Ball bearing sliding ram travels 21½". Cuts all types of materials at any angle.

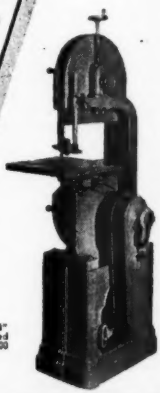
Not a pound, not a horsepower "loafs" in a Walker-Turner Machine Tool. Thoughtful design and careful selection of materials have made them flexible, versatile and stream-lined—yet rugged and accurate. And most of them operate on minimum horsepower requirements.

They are substantially increasing production on thousands of machining operations, involving materials from steel to plastics. They are scoring marked savings for their users in capital investment, operating costs and power consumption. If you're interested in advantages like these, write for our catalog today.

**WALKER-TURNER COMPANY, Inc.**
PLAINFIELD, N. J.



20" MULTI-SPINDLE DRILL PRESSES—2, 4, 6-spindle models. Hand or power feed.



BAND SAWS — 14" and 16" models. Speed range from 61 to 5300 s.f.m.

walker-turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

## MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

# GOT IT!

## AN ADJUSTABLE TOOL HOLDER

**ONLY THE CLARK LATHE TOOL HOLDER HAS ALL THESE EXCLUSIVE FEATURES**

1. Each Holder accommodates four or more sizes of square or round tool bits.
2. Vise grip jaw rigidly clamps short tool bits.
3. Dual or narrow tool bits are firmly held for cutting-off or special forming operations.
4. Solidly grips and supports carbide bits and boring bars.
5. Vise grip holds bits of brittle alloys more securely without breakage.
6. Tilted position of screw and head provides unobstructed view of work.

**Each individual Clark Tool Holder will accommodate not one but *four* sizes of tool bits.**

Made in complete range of shank sizes with standard 15° cutter channel, also parallel type for Carbide cutters and boring bars, in both right and left hand offset.

***See Clark Exhibit K-617***
***National Metal Congress, Cleveland, Ohio***
***October 16th through 20th***

***See Your Jobber Now! Or Write For Bulletin*** —TDJ-9

*Robert H. Clark Company*

9330 SANTA MONICA BOULEVARD • BEVERLY HILLS, CALIFORNIA

**No. P-62-R holding CLARK Boring Bar**

Lathe centers used to produce Gauge-Matic Discs must be able to take a lot of punishment and remain accurate. In addition to severe wear, further strain is imposed on the centers by the shock of the grinding wheel on the radii of the gauge.

Lathe centers of High Speed Steel lasted about a week on this job. Centers made of Graph-Tung Steel remained accurate and true and gave excellent performance 24 hours a day, seven days a week for 3 weeks! A total of 504 hours of uninterrupted, accurate, wear-resisting, service. A marvelous record, but typical of the job Graph-Tung Steel is doing wherever it is used.

Graph-Tung, a water hardening steel, has given excellent results when used for tools, dies, brake drums, cylinder liners, pump tubing, bushings, etc.

Today Graph-Tung and other Graphitic Steels, Graph-Mo, Graph-Sil, Graph-Al, Graph-M.N.S., are helping to hasten an early peace. Tomorrow they will be ready to speed production of your new products. Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

# Save Costly Tie-Ups of Large Production Units with this

# LOW-COST, VERSATILE SAW

*SPECIFICATIONS*
*WELLS No. 8*

**CAPACITY:**
Rectangular . . . . 8" x 16"
(Special Guides) 5" x 24"
**ROUNDS:** . . . . . 8" diameter
**MOTOR:**
½ H.P. current optional
**SPEEDS:** . . . . . Selective
60, 90, 130 ft. per min.
**WEIGHT:**
Approximately 750 lbs.

You can avoid costly tie-ups of large, special production units in your plant by using a Wells No. 8 Band Saw for odd metal-cutting jobs. It can be used on production . . . in stores or tool rooms . . . or on maintenance work.

The Wells No. 8 with 3-speed selection insures efficient operation. Gravity feed and automatic shut-off allows one man to operate 2 or more Wells Band Saws.

Low first cost, installation and power cost. Simple, rugged construction insures long life—minimum upkeep.

See your Distributor or write direct for complete details on this versatile, low-cost metal-cutting band saw.

Wells SAWS

Wells

*Products by Wells are Practical*

## METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
1940 ASH STREET, THREE RIVERS, MICH.

## To Precision Standards

**Precision finish of every part in Danly standard die sets makes possible Danly National Assembly. The resultant perfect fit saves you time and money through faster setups and longer, trouble-free operation.**

**Every Danly Die Set is individually assembled to your specification, through the Danly Plan of National Assembly to Precision Standards.**

**DANLY MACHINE SPECIALTIES, INC.**
***2100 South 52nd Avenue • Chicago 50, Illinois***

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**DIE MAKERS SUPPLIES • *Welded Steel Fabrication***

THESE are only two of the many different types of jobs that can be done with the versatile ROTOREX UNIVERSAL GRINDER. You can do all kinds of sharpening and then quickly set up the machine for production jobs. These operations include Cylindrical Grinding, Internal Grinding and Radius Grinding.

The ROTOREX is precision built for today's demands of accuracy and close tolerances. Its simplicity of design and convenient controls make it easy for even inexperienced operators to efficiently produce after a short training period.

Use the coupon below to obtain our free catalog with complete information on how the ROTOREX can help you on your particular job.

DOUGLAS MACHINERY CO., INC.
150 Broadway, New York, Dept. B-7
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Name_____ Title_____
Company_____
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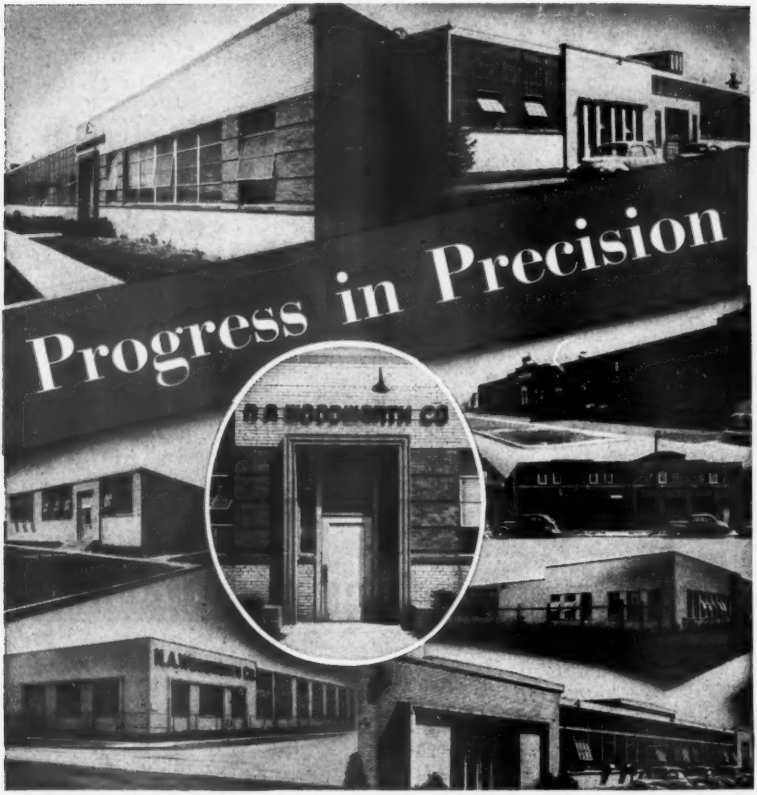
**DOUGLAS MACHINERY CO., INC.**
150 BROADWAY • NEW YORK 7, N. Y.




WOODWORTH will give industry the means to build the finest peacetime products this nation has ever known. From the "know how" of its precision experience have come sound, workable advances in tool engineering that have already met the critical test of war production during this great emergency.

Such progress in precision inspires confidence and it is from this point that Woodworth looks carefully at the job of giving industry . . . today and tomorrow . . . accuracy it can trust.

ACCURACY YOU CAN TRUST

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PRECISION GAGES • GROUND THREAD TAPS • FORM TOOLS • PRECISION MACHINED PARTS • HEAT TREATING • PLATING

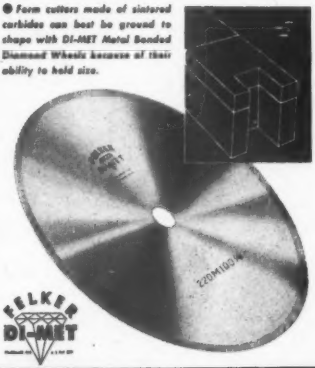
# Carbide Grinding Suggestions with DI-MET DIAMOND ABRASIVE WHEELS

● *For offhand grinding or for production grinding of carbide tipped tools, DI-MET Resinoid Bonded Diamond Wheels are of advantage because of their fast-cutting ability, smooth finishes and cool operation.*

**PRODUCTION GRINDING** generally requires the fast, free cutting action of DI-MET RESINOID BONDED DIAMOND WHEELS, since greater amounts of metal can be removed in a given period with complete safety to the tool. Crazing or cracking of tip surfaces is eliminated because the resinoid bonded wheels cut so freely—will never develop sufficient heat to injure the carbide surfaces.

**FORM CUTTERS** can best be shaped by use of DI-MET *METAL BONDED* DIAMOND WHEELS. This is true especially if the diamond wheel rim is of such shape as to grind directly the desired tool contour. The metal bonded wheel maintains its shape for long periods with imperceptible wear—thus delicate corners stay out to size, and accurate radii are maintained. DI-MET METAL BONDED WHEELS are also successfully applied to form grinding when use of a profiling attachment is indicated.

● *Form cutters made of sintered carbides can best be ground to shape with DI-MET Metal Bonded Diamond Wheels because of their ability to hold size.*



**DI-MET DIAMOND HONES**

Available with single or double resinoid bonded diamond sections for hand honing cutting tool edges.

**Both metal and resinoid bonded wheels can be used for offhand tool grinding. Although somewhat slower in grinding ability, metal bonded wheels compensate by longer wheel life. Write for the DI-MET Catalog showing wheel types and sizes. Available from any DI-MET distributor.**

**FELKER MANUFACTURING COMPANY**
1111 BORDER AVENUE, TORRANCE, CALIFORNIA
*Branch offices and distributors in all principal cities*

MANUFACTURERS OF DIAMOND ABRASIVE WHEELS

# GILRON THREAD GRINDING COOLANTS ARE TAILOR MADE

As a tailor-made suit is designed, cut and fitted to the individual, so a Gilron coolant is designed and developed by Gilron engineers to meet perfectly the particular requirements of the work in hand.

Beginning with Gilron's engineered oil as a base, each Gilron thread grinding coolant is adjusted to the material which is to be ground, the specified finish to be attained, the grinding equipment which is being used and particularly its speed and feed characteristics.

Thus production of inspection-approved work is increased and critical war products flow with less interruption.

A convincing list of satisfied users testifies to the value of this *new* Gilron development. It will pay you to investigate. Write for data unit T.

Gilron PRODUCTS COMPANY

1557 EAST 40th STREET
CLEVELAND, OHIO

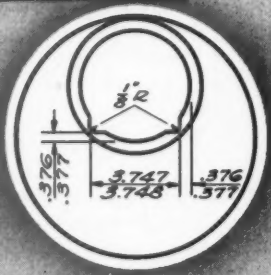
SCIENTIFIC COOLANTS
DRAWING-GRINDING-CUTTING

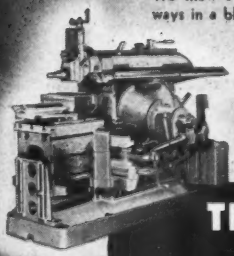
# INTERNAL SHAPING...

In the field of internal shaping alone, Cincinnati Shapers are used on a long list of "hard to get at jobs"—from cutting internal key ways to cutting symmetrical and non-symmetrical holes.

We show a Cincinnati Shaper shaping internal key ways in a blind hole—a "hard to get at job." Remember, a Cincinnati Shaper, the tool of many uses, will always be busy in your shop.

Write for Catalog N-2, describing these powerful accurate Shapers.



THE CINCINNATI SHAPER CO.

CINCINNATI OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

# The Sunnen Precision Honing Machine – with New Coolant Pump and Base –

## Provides GREATER HONING SPEED and ACCURACY

With the addition of a new base that contains a pump for supplying honing fluid, the Sunnen Precision Honing Machine is setting new standards of accuracy. Honing is faster, too. The honing fluid carries away all cuttings, keeps the abrasive stone sharp, and cools the part being honed.

With the Sunnen Precision Honing Machine, accuracy is guaranteed to be within .0001"— and has been held to .000025". A super-smooth finish can be produced. On certain types of metal, a finish of 2 to 3 micro inches can be obtained.

- Hones and finishes cylinders from .185" to 2.625" in diameter
- Can be used in either ferrous or non-ferrous metals — plastics — ceramics, etc.
- Does not require skilled labor
- No jigs or fixtures needed
- Economical to operate
- Can be set up to operate in one minute

Write for a free bulletin giving details about this low-cost honing machine — or ask a Sunnen engineer to show you how it can be used on your jobs.

The coveted Army-Navy "E" waves over the Sunnen plant — evidence of the important part Sunnen equipment is playing in the war effort.

*Typical Jobs*

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping—and gave a straighter hole.

Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter — held to .0002", stock removal .001", sixty per hour.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

Roller Bearing Outer Race. Finish improved from 12 micro-inches to 2 micro-inches.

Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.

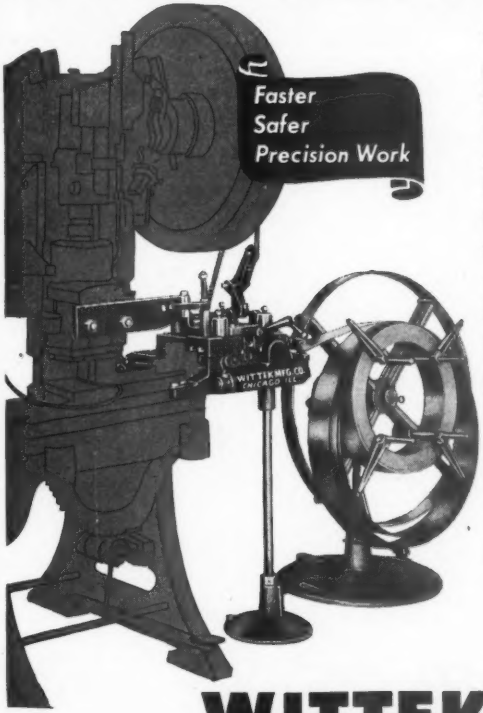
SUNNEN

**SUNNEN PRODUCTS COMPANY,** 7947 Manchester Avenue, St. Louis 17, Missouri

*Canadian Factory: Chatham, Ontario*

# *Planning Peacetime Production Using Coiled Strip Stock?*

## Equip with
# WITTEK
## *Automatic* Roll Feeds and Reel Stands




Wittek Roll Feeds are being used extensively by war plants in their large volume production of high quality metal stampings. The flexibility of Wittek Roll Feeds will assist these plants in their peacetime conversion through their adaptability to various jobs. Keen competition will demand the utilization of equipment to its point of highest efficiency. If your postwar plans include punch press production of parts from coiled strip stock—investigate now the many possibilities of Wittek Roll Feeds and Reel Stands.

***Write for catalog, prices and recommendations***

**WITTEK**
**MANUFACTURING CO.**
**4305-15 W. 24th Place, Chicago 23, Ill.**

*Automatic*
ROLL FEEDS
AND
REEL STANDS

THERE IS A BARNES BLADE FOR
*Every* SAWING OPERATION

*for*
SMOOTH-CUTTING
TROUBLE-FREE
SERVICE
*on*

**CONTOUR SAWING**

## BARNES NARROW WIDTH METAL CUTTING BAND SAWS

In contour sawing, Barnes Narrow Width Band Saws always provide consistently efficient performance. Their accurately milled and uniformly hardened teeth provide the smooth cut required in this type of work.

**SUPPLIED IN HANDY TANGLE-PROOF CARTON WITH "QUICK INVENTORY" RECORD**

Barnes Narrow Width Band Saws are shipped in 100 ft. coils in a carton which not only permits quick and easy removal of required lengths but also provides a "quick inventory" method of recording the amount of stock used. The band saw is loosely coiled, eliminating checks, yet it is confined so that it never tangles.

FOR FULL INFORMATION ON THESE AND OTHER BARNES BLADES, SEE YOUR BARNES DISTRIBUTOR . . . IF YOU'RE FACED WITH A METAL SAWING PROBLEM, THE SERVICES OF A FACTORY-TRAINED BARNES SERVICE ENGINEER ARE AT YOUR DISPOSAL.

**W. O. BARNES CO., INC.** 1919 - 1944
**DETROIT 14, MICHIGAN** ○ TWENTY-FIFTH ANNIVERSARY ○

# WITHOUT QUALIFICATION, NORBIDE TIPPED ROYAL PURPLE* PLUG AND RING GAGES ARE MORE ACCURATE OVER A LONGER PERIOD—AND THEREFORE MORE ECONOMICAL THAN ANY OTHER GAGES OF THIS TYPE...

Norbide (boron carbide) approaches the diamond in hardness—yet this is but one reason for its outstanding qualities when used to tip plug and ring gages and other wear parts. Another reason is the fact that this material is non-metallic and therefore cannot charge. It cannot pick up lint, dust or metal particles that might scratch and scrap valuable parts.

Reports like this indicate user's enthusiasm—"measuring cost was 1/11th that of H. S. S." . . . . "275,000 holes plugged without showing measurable wear" . . . . "gage wore only .0001" after measuring 670,000 holes" . . . . "gaged over 500,000 grinding wheel holes—H. S. S. gages wore out after 3,000 holes."

A test of this perfect tipping material will convince you that the New England Royal Purple line of gages, contact points, anvils, etc. offers one of the most economical steps that can be taken by any inspection department.

*Royal Purple color is used on the steel shanks of all New England boron carbide products for quick identification.

"Norbide—Trademark of Norton Co. Reg. U. S. Patent Office"

NORTON ABRASIVES

*What's that got to do with*
**OILSTONES?**

*The answer: EVERYTHING!*

For only a properly sharpened knife can do such an expert job so easily and quickly.

The same goes for machine cutters. To do the best work quickly, the edge must be an unbroken straight line; no saw teeth—no matter how microscopic—to bear the full load, break off, rub and generate heat.

Hand stoning as your final sharpening operation most nearly produces that "unbroken straight line," and India and Hard Arkansas Oilstones in hundreds of ingenious shapes and sizes, and at ridiculously low cost, are the unrivaled standards for such precision sharpening.

Have one of our field men or your Industrial Distributor's Representative show you the many special shapes and sizes to fit your own particular operations.

*In the Meantime*
THIS BOOKLET, "Hand Stoned Cutting Tools," will prove an eye-opener for everyone interested in tool improvement and conservation. How many copies can you use?

BEHR-MANNING • TROY, N. Y.
(DIVISION OF NORTON COMPANY)
Also Reliable Coated Abrasives Since 1872

SPECIFY Precision LATHE ATTACHMENTS

IMMEDIATE DELIVERY FROM STOCK

For 10" Atlas & Logan, 9" South Bend ½" Capacity Lathes, etc.

LEVER TYPE CROSS-SLIDE
List $45.00

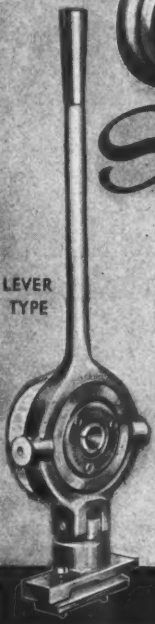
LEVER TYPE DRAWBAR
List $38.95

Order from your dealer or write us for literature.

HAND TYPE BREN Collet
$4.50 ea.

SpeediChuk
WITH THE Precision BREN COLLET

HAND DRAWBAR
$18.50



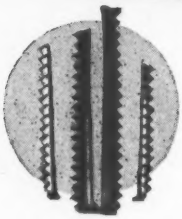
LEVER TYPE

- Increases ½" collet capacity lathes to ¾".
- Ready for instant use and interchangeable on any 1½" x 8 thread spindle lathe . . . Atlas, Logan, 9" South Bend, Clausing, etc.
- Full Spindle Accuracy.
- LEVER TYPE for continuous production. Feather pressure releases work while lathe is running. LIST $79.50, Collet extra.
- HAND TYPE for use where quantity production is not required. Lathe must be stopped to open and close collet. LIST $19.75, Collet extra.

GENERAL DIE-STAMPING-TOOL COMPANY
PRECISION COLLET DIVISION 265 Canal Street, New York 13, N.Y.

# It is NOT NECESSARY to SCRAP

## A MACHINED PART BECAUSE OF IMBEDDED BROKEN TOOLS



When a tap or other tool breaks off in a work part that is being machined, it may be removed by the Elox method without effecting the threads which have already been cut or the surface metal of the hole.

It is done by electrical disintegration using a low voltage, high amperage current with a constant flow of cooling water at the contact end of the electrode. The unit does not revolve. A 110/115 volt 50-60 cycle alternating current outlet and a convenient supply of tap water are all that is needed for the Type E. Disintegrator. The Type H Disintegrator includes its own coolant supply system.

The Elox method is also used to "drill" holes of various shapes in hardened dies and machine elements without annealing.

***Write for Technical Bulletin and Specifications***

Type "H" Disintegrator

CORPORATION **ELOX**

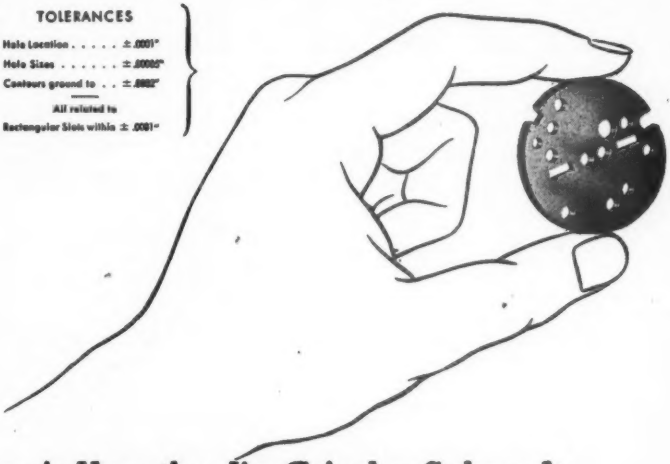
3-252 GENERAL MOTORS BLDG.
DETROIT 2, MICHIGAN
*Plant—18273 LIVERNOIS AVENUE*
DETROIT 21, MICHIGAN

# A Tough Hole-Grinding Job?

**TOLERANCES**

Hole Location . . . . . ± .0001"
Hole Sizes . . . . . ± .00025"
Contours ground to . . ± .0002"

All related to
Rectangular Slots within ± .0001"



## Here's How the Jig Grinder Solves It

It's anybody's guess how long this intricate hole-grinding job would normally take, using the tedious toolmaker's buttons and locating-plug methods...especially to such tolerances. But it's no problem for the Moore Jig Grinder.

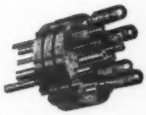
This unique machine precisely relocates holes and finish-grinds them within .0001". And then it checks its own work.

The master gage illustrated is one of many identical gages, each used by different manufacturers to determine the final production accuracy of a war-vital ordnance part. With the strictest interchangeability of parts called for—the burden of proof remains the gage's job. And, in turn, the accuracy of the gages depends on precision hole-grinding and finishing.

Toolmakers who measure their craftsmanship in strict tolerances find the Moore Jig Grinder the answer on all counts. You will, too.

The Moore Jig Grinder has the capacity to grind holes from .030" to 4", provides .00005" per inch accuracy of lead screws and grinding speeds of 14,000 and 50,000 RPM.

May we send you a detailed bulletin on its application and ease of operation? There is no obligation, of course.



Proof of accuracy: Three individually ground master gages plugged together.

**MOORE SPECIAL TOOL CO., INC.**
726 UNION AVE., BRIDGEPORT 7, CONN.

*P.S. All the holes in the gages illustrated were bored on the Moore Jig Borer. With its built-in system of coordinate hole location the Moore Jig Borer enables the operator to spot, drill, bore and ream all holes in a work piece with minimum tool changes. And its accuracy is held within .00025" in any position of the table. Investigate its advantages in your applications.*

# Moore Jig Grinder

THE ONLY MACHINE OF ITS KIND

# Heat Treat Your Own Small Parts...

## SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1. Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
2. Saves time and expense of drawing or tempering small metal parts in large furnaces.
3. Cuts handling time when normalizing or annealing small parts. No waiting.
4. Conveniently available for pre-heating for subsequent high-speed hardening.
5. Eliminates shut downs and delays in servicing emergency repair orders.

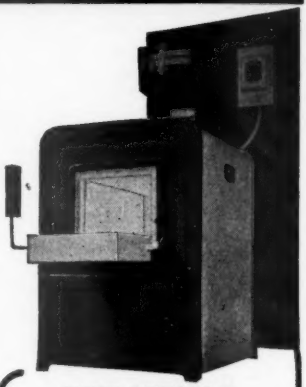
### AVAILABLE IN TWO SIZES

| *Type* | *Chamber Capacity* | *Amps 115 V* | *Watts* | *Amps 230 V* | *Price* |
|---|---|---|---|---|---|
| MH-3 | 8"W 6"H 14"L | 29.6 | 3400 | 14.8 | $124.00* |
| MH-4 | 10"W 6"H 18"L | .... | 4800 | 20.9 | $191.00* |

**Includes Hearth Plate*

**MAX. SAFE TEMPERATURE**—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

**AUTOMATIC CONTROL**—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.



### REPLACEABLE HEATING ELEMENTS

Replaceable nickel chromium resistors embedded in rectangular refractory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel — furnace structure remains undisturbed.

**FREE**—Complete data covering specifications, additional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.

**COOLEY ELECTRIC MANUFACTURING CORP.**
32 SOUTH SHELBY STREET • INDIANAPOLIS 7, IND.

# AMMCO
## 7" SHAPER
*"A Precision Machine of a Thousand Uses"*

## IT'S PORTABLE

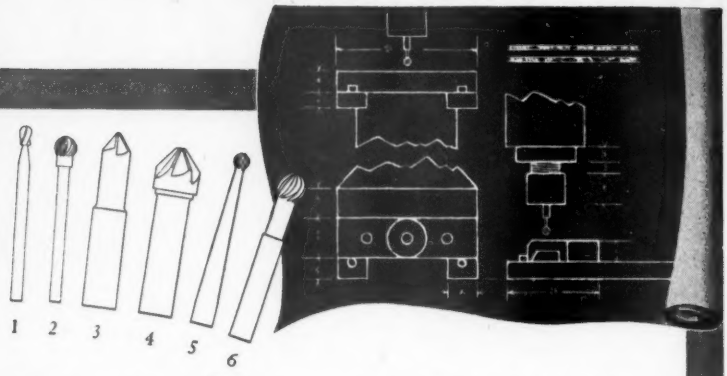
- **Saves time and steps!**
- **Can be moved from job to job in tool and die shop!**
- **Just wheel up to bench--plug in--and go to work!**

On jobs requiring a stroke of 7" or less, the AMMCO 7" PRECISION SHAPER will enable you to save a lot of time and expense in a set-up which would be required for larger shapers. Furthermore, the AMMCO will enable you to get away from the cost of operating a big shaper on small work.

Portable Cabinet model enables this shaper to be moved about the shop.

***Write today for specifications and prices***

AUTOMOTIVE MAINTENANCE MACHINERY CO.
2100 Commonwealth Ave.—North Chicago, Illinois, U. S. A.




## TO YOUR SPECIFICATIONS

# *Carbide-tipped* ROTARY CUTTERS

We are now equipped to turn out custom-made CARBIDE Rotary Cutters to meet your most exact requirements—precision ground for precision performance. Send your sketches or blueprints to M. A. Ford Mfg. Co. Inc., 739 W. First St., Davenport, Ia. No obligation of course.

(1) Carbide end mill—$\frac{1}{8}$" diam. —$\frac{1}{16}$" radius end.
(2) Carbide ball—$\frac{1}{4}$" diam. $\frac{1}{8}$" shank, $2\frac{3}{4}$" overall length.
(3) Carbide end mill—2 flute, RH operation.
(4) Carbide chatterless countersink—$\frac{3}{8}$" shank.
(5) Carbide ball—$\frac{3}{16}$" diam. $\frac{1}{4}$" shank, $3\frac{1}{4}$" overall length.
(6) Carbide ball—precision ground .375" diam. $\begin{pmatrix}+.0000\\-.0002\end{pmatrix}$

**Ask for your copy of catalog showing our standard line of Carbide Cutters.**

**FORD**

*The mark of a GOOD File*

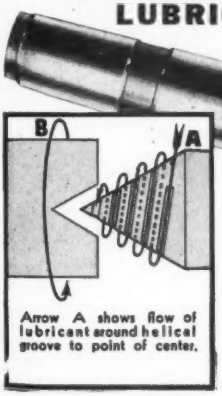
# FOR COOLER Machine Tooling

## Use CMD Helical Groove CENTERS

### CMD CENTER POINT LUBRICANTS

**CMD CENTER POINT LUBRICANT**

prevents overheating and annealing of center points, speeds up work and permits finer tolerances because centers can be drawn up snug against the work.

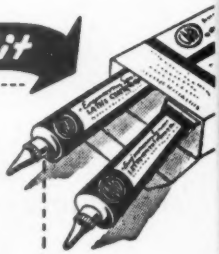



Arrow A shows flow of lubricant around helical groove to point of center.

The exclusive left hand helical groove in **CMD Centers** holds a reserve supply of lubricant and conveys it constantly to the extreme point of center! No burned out centers! No stopping machine to relubricate centers!

**The exclusive helical groove in *CMD Helical Groove Centers* conveys lubricant to the extreme point of the center and *expels* heat, generated by cutting tools. CMD *Center Point Lubricant* withstands pressure greater than 50,000 lbs. per square inch . . . Use this better center and better lubricant for cooler machine tooling!**

## *Write for* FREE *Sample Kit*



**CHICAGO MANUFACTURING & DISTRIBUTING CO.**
**Dept. 9J, 1928 West 46th St., Chicago 9, Ill.**

Send circular on CMD Helical Groove Centers without obligation to us, send FREE sample kit containing a tube of CMD CENTER POINT OIL and a tube of CMD CENTER POINT LUBE (grease) with directions for making an amazing, simple test.

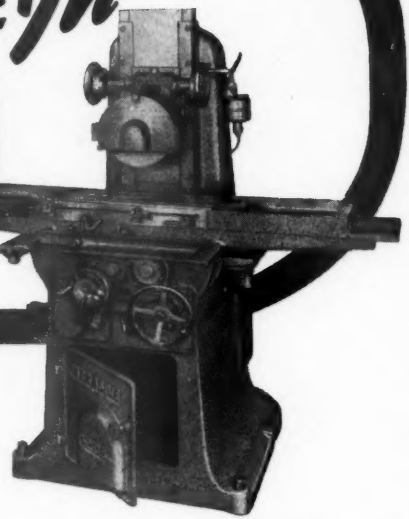
NAME .....

FIRM NAME .....

ADDRESS .....

ACCURACY & DEPENDABILITY

"Built-In"



ABRASIVE
3-B
SURFACE GRINDER

In excellence of design, workmanship, and materials of construction, the ABRASIVE 3-B is "tops" in surface grinders. To insure perfect alignment and freedom from distortion the bed of this machine is a massive one-piece casting weighing over 1500 lbs. Typical of ABRASIVE quality, the precision spindle of alloy steel, hardened, ground and lapped, is carried in a phosphor bronze box at front, adjustable for wear, and super-precision ball bearings at rear. For accuracy and dependability, specify ABRASIVE 3-B.

ABRASIVE
ACCURACY BOOSTS PRODUCTION

AVAILABLE FOR
PROMPT DELIVERY

*Send for Descriptive Bulletins*

ABRASIVE MACHINE TOOL COMPANY - - EAST PROVIDENCE 14, R. I. - - Dealers in Principal Cities

# with "HARDSTEEL" Drills

These are just a few of the many uses for "HARDSTEEL" drills—the drills that drill steel hardened by any method without annealing.

1. Drill holes in full hardened dies.
2. Drill holes in armor plate.
3. Remove broken set screws on a drill press.
4. Start holes in case hardened parts.
5. Enlarging holes in hardened parts to accommodate last minute changes.
6. Drill spring steel after tempering.
7. Drill parts after hardening to avoid warping or distortion.
8. Drill production parts after hardening to speed matching at assembly.
9. Drill work-hardening materials.
10. With a slight change in point grinding, drill hard carbon and plastics.

To save time and speed production, all you need are a drill press, a "HARDSTEEL" drill and the "know-how" given in detail in the "HARDSTEEL" Operators Manual. It tells recommended speeds, how to grind on an ordinary wheel, when to use coolants, how to use drills for countersinking and counterboring and a wealth of similar information. Write for your copy today.

"YOU HARDEN IT — WE'LL DRILL IT"

**BLACK DRILL COMPANY • Division of BLACK INDUSTRIES**

**1400 EAST 222nd STREET • CLEVELAND 17, OHIO**

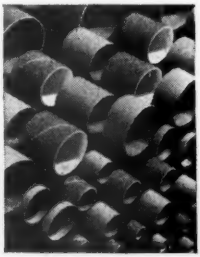
**"HARDSTEEL"**

DRILLS · TOOL BITS · SPECIAL TOOLS

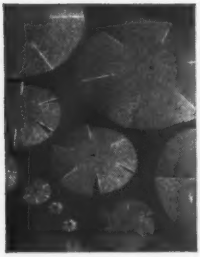
# WE CALL THEM "WEAPONS FOR PRODUCTION"

THESE coated abrasive products by Carborundum so speed up and improve the finishing of a thousand and one metal parts that they have contributed mightily to the war effort. There are plenty of jobs on which they can be used in your plant.

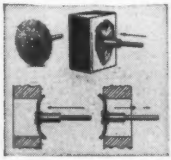
**"ALOXITE" CLOTH CARTRIDGE ROLLS**—for cleaning, polishing out-of-the-way surfaces. Made in straight or tapered forms ⅜ to 1 inch diameter, 1 to 2½ inches long.



**"NOLAP" ABRASIVE BANDS**—spirally wound, no overlapping splice. For a multitude of polishing jobs on small and intricate parts. Diameters ¼ to 3 inches, widths ⅛ to 3 inches—wide range of grits.



**MULTI-SLOTTED DISCS**—for removing burrs, breaking down edges of holes—fast cutting—flexible—durable.



**"ALOXITE" CLOTH**—no end to the number of metal finishing jobs to be done with this abrasive cloth—in 9 x 11 inch sheets—in "Economy" Rolls.

*Coated Abrasives by Carborundum of course, include all types of metal finishing discs and belts. Send for illustrated booklet.*
*The Carborundum Company, Niagara Falls, N. Y.*

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Buffalo, Pittsburgh, St. Louis, Cincinnati, Grand Rapids

**Coated Abrasives by CARBORUNDUM**
TRADE MARK

(Carborundum, Aloxite and Economy are registered trade marks of and indicate manufacture by The Carborundum Company)

# behind the SPINDLE is the BEARING

XLO
EX-CELL-O for PRECISION

ONLY Ex-Cell-O Spindles are equipped with Ex-Cell-O Precision Ball Bearings. Available for many makes of grinding machines and other machine tools, Ex-Cell-O belt-driven and motorized Spindles are your assurance of long, dependable performance.

## EX-CELL-O CORPORATION - DETROIT 6

*Precision* MACHINE TOOLS • CUTTING TOOLS • AIRCRAFT AND MISCELLANEOUS PARTS

**A plain plug or ring gage, worthy of the name, must have a hard, durable surface, mirror finish and a uniformly smooth face that can withstand the microscopic scrutiny of the surface analyzer.**

**Achieving this perfection is not easy. Grinding the plug or ring down to the right amount of lap stock requires that intangible quality known in shop parlance as "feel". Lapping the minute grind ridges down to an even, durable surface and, at the same time, holding the dimension within tolerance, is another example of "feel".**

**Highly skilled craftsmanship plus a constantly controlled precision inspection—that is the Vinco formula for producing a perfect cylindrical gage.**

**Don't let the simplicity of cylindrical design swerve better judgment. A perfect cylindrical gage is a sound investment. To insure that investment, buy Vinco.**

**VINCO CORP., 8873 SCHAEFER H'W'Y, DETROIT 27, MICH. Sales Offices: NEW YORK, CHICAGO, CLEVELAND**

**MILLIONTHS OF AN INCH FOR SALE BY VINCO**

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development

# PRODUCTION "SUPERCHARGER"

TURNER
UNI-DRIVE
Motorizes Machine Tools

## Keeps Machine Tools Hustling

1 **No belts to shift. Drives to large step of cone at all speeds.**

2 **Eliminates overhead line and counter shafts.**

3 **All advantages of geared head, with belt drive smoothness.**

**TURNER UNI-DRIVE** is speeding schedules on every shift in hundreds of plants. Eases operators' work. Cuts costs. Saves time. Gets increases in production capacities running up to 25%—100%—300%. Each unit operates independently of all others—high and low speeds at will.

### SOME TYPICAL USERS OF TURNER UNI-DRIVE

American Brake Shoe & F. Co.
Kellogg Division
Southern Wheel Div.
Augusta Arsenal
Bendix Aviation Corp.
Brown-Lipe-Chapin Div. General Motors
Cessna Aircraft Corp.
Chicago, Rock Island & Pacific R. R. Co.
Chicago Screw Co.
Delco-Remy Co.
Div. General Motors
Doehler Die Casting Co.
Electric Auto-Lite Co.
Frankfort Arsenal
Frisco Lines
Holtzer-Cabot Elect. Co.
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Kohler Corporation
Monsanto Chemical Co.
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NOW AT WORK FOR VICTORY ★★★

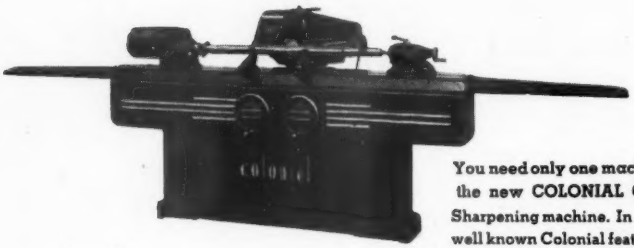
**For lathes, shapers, milling machines, turret lathes, radial drills, boring mills, hobbing machines, Brown & Sharpe and Cleveland Automatic Screw Machines and other tools—**

**The TURNER UNI-DRIVE COMPANY**
*(Sales Division: Turner Machinery Co.)*
**3416 Terrace St. Kansas City 8, Mo.**

PRODUCING MACHINE TOOL DRIVES • ORDNANCE TOOLS • AIRCRAFT FITTINGS

# DO YOU WANT TO SHARPEN . . .

. . . broaches up to 84" long?
. . . small broaches?
. . . flat broaches?
. . . round broaches?
. . . more accurately?
. . . WITH WOMEN OPERATORS?



You need only one machine to do all this: the new COLONIAL CS-2-84(*) Broach Sharpening machine. In addition to all the well known Colonial features, you will find on this machine such important features as:

Full anti-friction double-row roller action to guide the sliding head plus use of light-weight alloy castings for the moving head, reducing weight to 1/3 that required with iron or steel construction. These two features provide a surprising ease of sharpener operation. To maintain this ease for life, moreover, all anti-friction bearings are completely sealed against entry of dust.

Where floor space is at a premium, a special roller curtain design (to protect ways of machine) enables, at slight additional cost, a reduction of 6 ft. in total floor space required for the machine when sharpening maximum length broaches.

Also available as extra equipment are double-ratio micrometer hand wheels to control feed to the ten-thousandth of an inch. Makes possible maintaining identical step per tooth in regrinding broaches.

★ For sharpening broaches up to 72 in. long, there is also the CS-2-72 with the same design and operating features.

BUY U.S. BONDS STAMPS

**colonial BROACH COMPANY**
**DETROIT 13, U.S.A.**
*Broaches — Broaching Machines - Broaching Equipment*

*No peaks*

**to cause wear!**

A notable advance was made in gage block manufacture when FONDA engineers developed the "ULTRA-FINISH" which eliminates *peaks* on the gaging surfaces.

It is the *peaks* that naturally are first attacked by wear—and soon are shorn off, leaving the block undersized. It is the *peaks* that cause the need for oil or other film to fill in the valleys, in order to provide suitable adhesive force in wringing. A film that of itself introduces further inaccuracies!

To all intents and purposes, FONDA gage blocks . . . with the "ULTRA-FINISH" . . . have no peaks on the gaging surfaces—and require no film for wringing. The amazingly smooth and wear-resistant gaging surfaces insure a *maintained* high accuracy . . . setting new modern standards in fine-precision measurement.

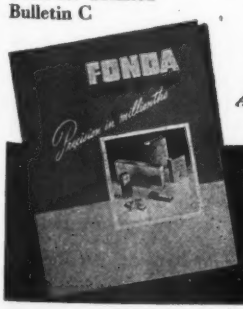
**PASSED HIGHEST TESTS DEVISED BY THE NATIONAL BUREAU OF STANDARDS**

Write for detailed Bulletin C

*Prompt Deliveries*

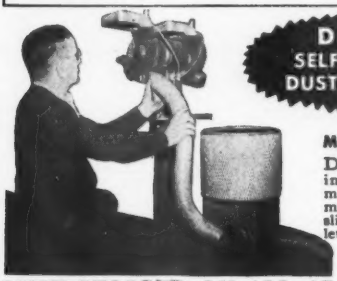
**FONDA GAGE COMPANY**
Stamford, Connecticut
***Agents in all principal cities throughout the World***

29




FONDA
*Gage Blocks*

# Quick way to STOP DUST!



**DUSTKOP**
**SELF-CONTAINED**
**DUST COLLECTORS**

**MODEL 600**
DUSTKOPS are installed in a few minutes. Flexible metal hose makes slip fit with dust outlets on grinder.

**MODEL 950**
This unit, with dust hoods, "ready to go," fits any double-end pedestal grinder not already equipped with wheel guards and dust outlets.

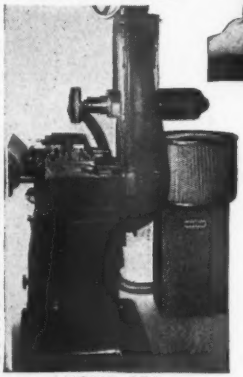
## *DUST STOPPED ON ALL ABRASIVE OPERATIONS AT LOWEST COST*

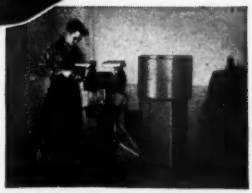
**MODEL 600**
With flat, spun glass filter for compact bench installation. Pulls all dust from two grinder wheels.

For quick, economical, effective, dust control *at the source*, install DUSTKOPS. Easy to attach to surface grinders, disc grinders, cutter and tool grinders, flexible shaft grinders—or to buffers, sanders and abrasive cut-offs—whether single or multiple units. Large or small models available.

DUSTKOPS are compact and portable. Entirely self contained, with motor, fan, cyclone separator (in all but smallest models) and spun glass filter. Flexible metal hose permits quick installation.

DUSTKOPS clean the dust-laden air without wasting heat. Efficient cyclone separator provides low maintenance. Many other features make DUSTKOPS ideal for your shop or laboratory. Immediate shipment of "standard" voltage units.





**MODEL 950**—has cyclone separator, plus spun glass filter. For medium duty work of all kinds.

**MODEL 950**—with cyclone separator means low first cost, low maintenance, even on production surface grinder.

(Left)
**MODEL 1250**—one unit handles dust from four wheels.

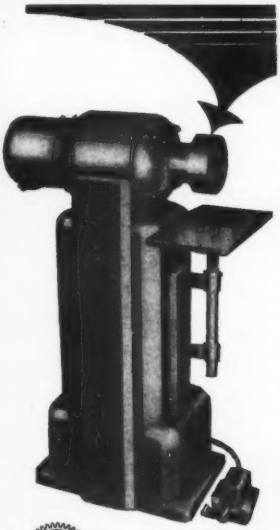
**MODEL 1250**—gets all dust and smoke from this heavy duty abrasive cut-off, at extremely low cost.

*Write* NOW for Bulletins

**AGET-DETROIT COMPANY**
617 First National Building • Ann Arbor, Michigan
Detroit Office: Tel. CAdillac 3090

# CAN YOU POLISH THESE PIECES —

## WITHOUT LEAVING CHUCK or COLLET MARKS?



## YOU CAN... WITH A LIMA MAGNETIC POLISHING LATHE

Magnetic chuck holds ferrous metal parts from 7/8" up. This chuck, with the use of interchangeable face plates and register plugs, makes the Lima Magnetic Polishing Lathe a most flexible unit to rapidly handle various size parts in polishing, burring or lapping operations. Entirely magnetic, the chuck has ample power to hold material rigid and secure, making possible mirror finishes, without leaving chuck or collet marks to be polished out after main operations are completed. A self-contained rectifier unit supplies DC current to chuck.

In addition, the *"Step-Release"* foot pedal control of the motor and chuck, is another important LIMA feature which increases handling speed. This control allows the operator freedom of both hands to be used in placing, processing and removing work from the chuck.

The Lima Magnetic Polishing Lathe is furnished in Pedestal or Bench type, powered by a dependable LIMA drip-proof motor. These motors are furnished in single or two speed, 2 or 3 phase, with speeds to 3600 rpm as required. Standard equipment includes a magnetic disc-type brake for rapid stopping of motor and chuck. Wire or write today for complete Engineering data.

Manufactured by

*The* **LIMA ELECTRIC MOTOR** *Company*

890 Findlay Road

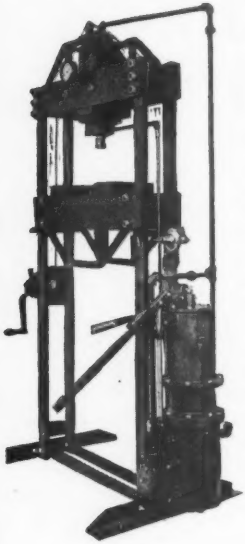
**LIMA, OHIO, U. S. A.**

MAGNETIC POLISHING LATHES GEARSHIFT DRIVES PEDESTAL GRINDERS ELECTRIC MOTORS

# *Adaptable to any job, these*

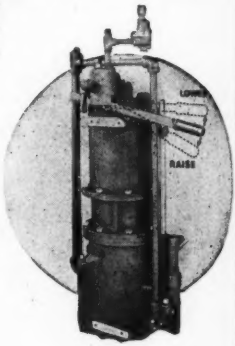
# *Low-Cost* KRW

## HYDRAULIC ARBOR PRESSES SAVE TIME, SPACE AND MONEY



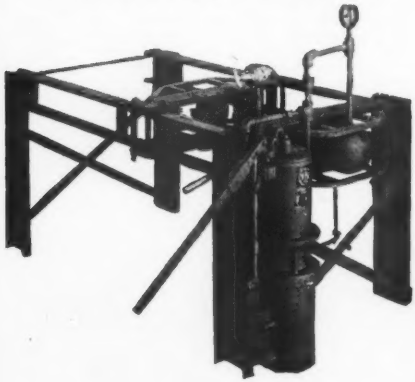
KRW Presses are designed to handle the great majority of pressing, bending and straightening operations normal to most industries. In addition, KRW Presses are adaptable to literally hundreds of special jobs. Using low-cost dies, manufacturing costs on many items are greatly reduced.

Using air pressure varying from 100 to 225 pounds, the resulting hydraulic pressure varies with the air pressure used. A built-in air regulator permits exact duplication of pressure on every stroke . . . this is important on many operations. KRW Hydraulic Arbor Presses are available for either vertical or horizontal operation or specially built to handle a particular operation. We also manufacture suitable capacity air compressors. Write for fully-illustrated Hydraulic Arbor Bulletin.
K. R. WILSON, 10 Lock St., Buffalo 2, N.Y.




### THE KRW SPEEDI-BOOSTER

THE REASON WHY KRW PRESSES ARE FAST AND ACCURATE. The KRW Speedi-Booster eliminates the need for the conventional Capstan wheel or pumping lever. Instead, it uses compressed air as the motive power operating the ram. Because the compressed air is controllable through a pressure regulator, any desired tonnage pressure at the ram can be obtained and duplicated. Ram movement (up, down or stop) is instantly controlled with the slightest fingertip movement of the lever.



All KRW special presses incorporate the time-proven features of the standard KRW Hydraulic Arbor presses. They are now available . . . BUILT TO ORDER . . . for quick delivery on all orders carrying a priority of AA-4 or better. Write for our new bulletin describing KRW Hydraulic Presses in 25, 50, 60 and 75-ton capacities.

KRW

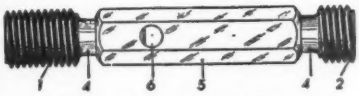
**K. R. WILSON**
10 LOCK ST., BUFFALO 2, N. Y.

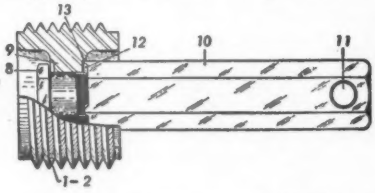
# CONSTRUCTION DETAILS

*for your* **CONVENIENCE**

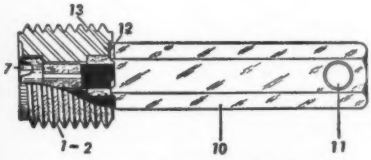
☆

*You and your employees may care to familiarize yourselves with gage terminology and construction. This is the first of a series presenting details on our various thread plugs, thread rings, plain plugs, plain rings and special gages.*

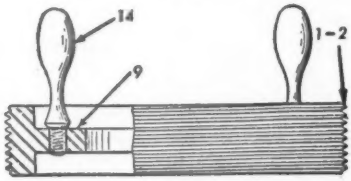
## *Standard Design of Thread Plug Gages*

Range: No. 0 to and including 1.510 inches




Range: Above 2.510 to and including 8.010 inches




Range: Above 1.510 to and including 2.510 inches




Range: Above 8.010 to and including 12.010 inches

1. "Go" gaging member
2. "Not go" gaging member
4. Shank
5. Taper lock handle
6. Drift hole or slot
7. Socket head screw
8. Hexagon head screw
9. Web
10. Handle for reversible or trilock gage
11. Cross pin hole
12. Locking prong
13. Locking groove
14. Ball handle

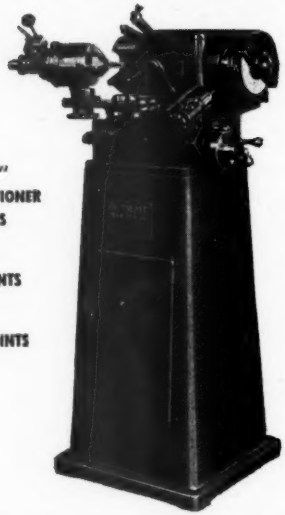
**PERFEX GAGE & TOOL COMPANY**
3604 GAYLORD AVENUE DETROIT 12, MICHIGAN

ACCURACY PERFEX OUR CREED

GROUND TAPS, THREAD GAGES, THREAD HOBS & SPECIAL THREADING TOOLS, SPECIAL TAPPING MACHINES

# DULL TAPS COST *MORE* than SHARP ONES

**Dull taps wear out quicker**
**Dull taps increase scrap**
**Dull taps decrease thread accuracy**



**"DETROIT" TAP RECONDITIONER**
**CHAMFERS**
•
**SPIRAL POINTS**
•
**POLISHES POINTS**
•

**The Detroit Tap Reconditioner makes it easy to keep taps sharp, quickly pays for itself, cuts tapping and tap costs.**

**The Detroit Tap Reconditioner puts you in a better position to meet tomorrow's stiff post-war competition.**

***Ask for Bulletin No. TRM-2***

BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

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DETROIT 11
MICH. U.S.A.

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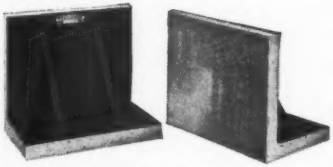
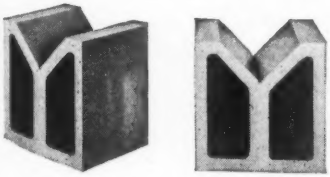
WORK

**SOLID PARALLELS**
14 sizes—From ¼x⅝-x6 in. to 1¼x2x12 in.

**BOX PARALLELS — 18 sizes**
From 1½x2x4 in. to 12x12x24 in.



**ANGLE PLATES — 22 sizes**
From 3½x4x4 in. to 24x24x24 in.



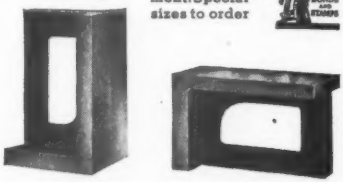
**V-BLOCKS — 7 sizes**
From 2x2½x5 in. to 12x12x12 in.

## *Choose* CHALLENGE!

High-speed production schedules are easy for **CHALLENGE SURFACE PLATE EQUIPMENT** because they're made from fine-grained, special analysis semi-steel castings, precision ground to the required accuracy. Specially heat-treated.

***This equipment includes —***
Solid and Box Parallels for setting and leveling to parallel and exact height for checking and inspection . . . Right Angle Irons for providing square reference lines . . . Angle Plates for clamping and holding work . . . and V-Blocks for supporting shafts and other cylindrical work when drilling, checking, inspecting, etc.

You will find these shop-tested aids make for fast, accurate *trouble free* production. Write today for detailed data on Challenge Surface Plate Equipment. Special sizes to order



**UNIVERSAL IRONS—4 sizes**
From 4x5x3¾ in. to 8x10x5½ in.

490

**THE CHALLENGE MACHINERY CO.**

MAIN OFFICE AND FACTORY:
**GRAND HAVEN, MICH.** ★ EASTERN SALES OFFICE:
**50 CHURCH ST., NEW YORK**

# DIE SPRING* FAILURE CAN BE CHECKED

* and other types of springs as well!

● Die spring breakage can be traced in almost every instance to one or more of the following causes:

*Improper clearance,* consisting of insufficient space between spring and guide rod (or guide hole). Correct by providing a clearance that permits the spring to operate freely, but still prevents buckling.

*Incorrect size and design.* Springs often fail when repeatedly compressed through their full range of deflection, or when operated too rapidly. Only springs designed for both the length and speed of the compression stroke should be selected.

The surest way to avoid failure is to check a Muehlhausen Die Spring Folder, which lists 200 sizes by rod and hole diameter, free length and load capacity for high speed, regular speed and heavy duty work. *Send for Die Folder today!*

**MUEHLHAUSEN SPRINGS**

EVERY TYPE AND SIZE

**MUEHLHAUSEN SPRING CORPORATION**
*Division of Standard Steel Spring Company*
875 Michigan Avenue, Logansport, Indiana

**When you change over to civilian products—here's how EUREKA Tool Steel Welding Electrodes will help you save time, material and avoid production delays.**

1. **You can repair existing die units to keep them in operation with a minimum of "down-time".**
2. **Changes can be made during die "try-out" periods by correcting design, rectifying errors, etc.**
3. **During die "change-over" contours, corners and edges of your old dies can be welded to adapt them to change in design.**
4. **Die units can be compositely fabricated by welding with desired tool steel electrodes, on mild or medium carbon steel, to form cutting edges or working areas.**

***Space does not permit detailed information here—so write us today for descriptive literature.***

***Distributors in principal cities of U.S.A. and Canada***

EUREKA TOOL STEELS ELECTRODES FOR EVERY KIND OF WELDING

*Welding Equipment & Supply Co.*

WELDING ENGINEERS WITH A COMPLETE SERVICE

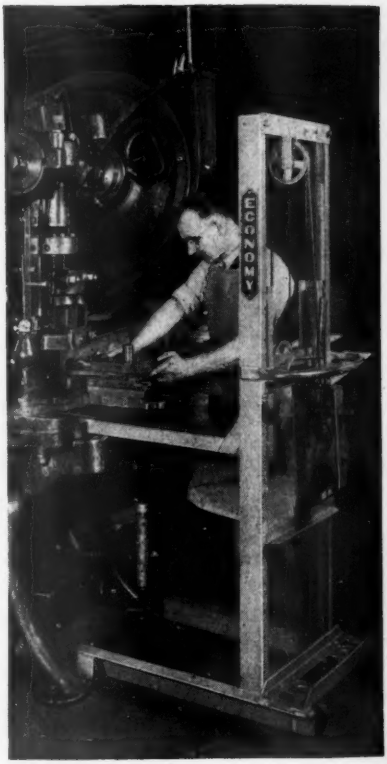
**223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN**

# SAVE PRODUCTION TIME

*with a*

# SHOPLIFTER

**One man can handle heavy dies alone. Not necessary to stop other machines to get help.**




MORE production per day from your machines if a Shoplifter is handy to do the heavy job of moving dies from storage racks to the press. In these times when maximum production of machines is of vital importance, much time and labor can be saved if the operator can handle the heavy work of changing dies without calling for help from other operators.

The Shoplifter is built for this job. Dependable and safe with a rated capacity of 500 lbs. (heavier machines up to 5000 lbs. can be furnished). Entire machine built of structural steel. Electrically welded throughout. Steel platform 24" x 24", lifts 54" above floor and lowers to within 4⅞" of floor. Overall height 72". Crank, up and down, hoist unit.

**ECONOMY ENGINEERING CO.**
**2659 W. Van Buren St., Chicago, Ill.**

*Price* **$147.50**

**IMMEDIATE DELIVERY**

# ANGLES

## To a minute in a minute

## with a BEMISINE

● The Bemisine speeds up and simplifies setting any angle from 0 to 90°—using only a 2" Micrometer*! *It holds the work! Faster than a Sine Bar or Protractor! A Jig Eliminator on Surface Grinders and Jig Borers!*

*Also used with standard gage blocks.

**SEND FOR** Bulletin describing this new solution for an old Problem!

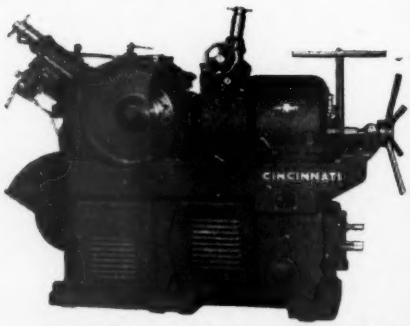
NICHOLS-MORRIS CORPORATION

50 CHURCH STREET—NEW YORK 7, N. Y.

# *OFFSET GRINDING

*"Offset grinding on a CINCINNATI Centerless Machine means that the grinding wheel merely grinds a narrow section at one end of the part. The greater portion, or the entire length of the part, contacts the regulating wheel to assure adequate driving force.

# another type of work




*CINCINNATI No. 2 Centerless Grinding Machine. Catalog G-456-1 gives complete details and specifications. Copy will be sent on request. For a brief description of all CINCINNATI Grinding Machines, look in Sweet's Catalog File for Mechanical Industries.*

Another example of the many variations in the centerless method of grinding, worked out by the CINCINNATI Application Engineers, is illustrated here.

The operation, known as *offset centerless grinding*, consists of grinding a section at one end of the part by the infeed method. The regulating wheel contacts a different section of the part or, as in this case, its entire length. *(see sketch)*

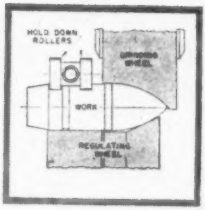
The machine is a CINCINNATI No. 2 Centerless Grinder, tooled up with the following equipment: special 8" infeed work rest with hand ejector, spring pressure hold-down roller, two work blades and retracting end stop; hydraulic profile truing for grinding wheel; hydraulic profile truing for regulating wheel. The hold-down roller reacts in two ways (1) it presses the part against the regulating wheel, maintaining contact and increasing

THE CINCINNATI MILLING MACHINE CO.

TOOL ROOM AND MANUFACTURING MILLING MACHINES . . SURFACE BROACHING MACHINES . . CUTTER SHARPENING

the driving force (2) it prevents any tendency of the part to cock between the wheels because of the grinding pressure being concentrated at one end.

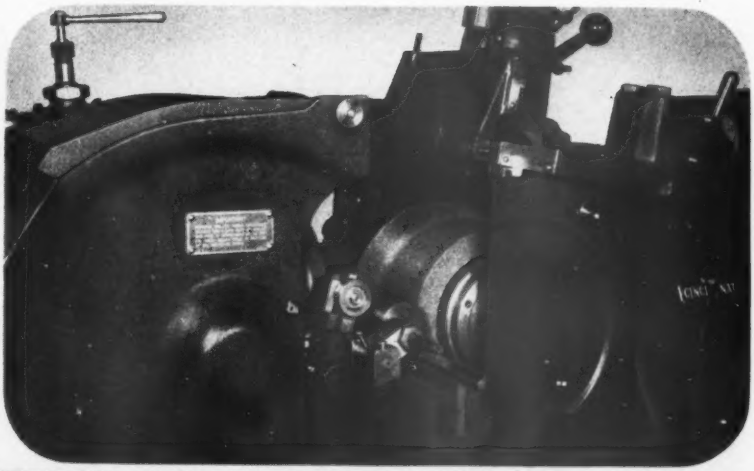
Offset jobs, like many other adaptations of the centerless method, require a thorough knowledge of both centerless and center-type grinding. CINCINNATI Application Engineers have been working out special production problems for many years. Their Centerless "know-how" is at your disposal.




**Left—illustration of the basic elements in offset centerless grinding.**

# for your CINCINNATI CENTERLESS

**Below—CINCINNATI No. 2 Centerless Grinder with special equipment for offset grinding.**



CINCINNATI GRINDERS INCORPORATED CINCINNATI 9, OHIO, U.S.A.

MACHINES . . CENTERTYPE GRINDING MACHINES . . CENTERLESS GRINDING MACHINES . . CENTERLESS LAPPING MACHINES

with

# CHROME CARBIDE GAGES

**The Griffin Process gives precision thread gage users a new kind of performance!**

**GRIFFIN PROCESS** lengthens gage life 20 times—and even more—depending upon material being gaged.

**GRIFFIN PROCESS** salvages old and worn gages or can be used for manufacturing entirely new gages.

**GRIFFIN PROCESS** is now used on thread plug gages of 3/8" or larger and on thread ring gages of 7/8" or larger.

**GRIFFIN PROCESS IS ECONOMICAL**—1/3 the cost of tool steel gages on basis of extra life and performance.

**Let us prove our statements—send your worn gages for chrome carbide processing. Quotations sent immediately. Finest workmanship, prompt deliveries!**

## WHAT IS THE GRIFFIN PROCESS?

It's a thoroughly proven, carefully developed method for welding a layer of fine grained, tough, wear-resistant CHROME CARBIDE to gage blanks. New threads are then ground from the solid and diamond lapped to size. Don't confuse this process with plating . . . Griffin gages have a thick deposit of chrome carbide extending from the crest of the thread to well below the root. "On size" dimensions are assured for long, hard service because of the extreme wear resistance possessed by this metallic carbide alloy.

## GEORGE O. GRIFFIN COMPANY

1301 WEST HADLEY STREET • WHITTIER, CALIFORNIA

*Chrome Carbide Thread Gages*

# 3 ALLISON COLLET CHUCKS

**MODEL No. 1** For 1 1/2" 8-thread spindle lathes — with 7/8" collet capacity — is unsurpassed as a combination chuck for either first or second operation work.

**MODEL No. 2** For 1 1/2" 8-thread spindle lathes — with 7/8" collet capacity — full circular low pressure cam activates the collet closing mechanism, thus giving any desired gripping pressure.

**MODEL No. 3** For 2 1/2" spindles and under — with 1 5/8" collet capacity — has same mechanical advantages as the No. 2 chuck.

*All Allison Collet Chuck closing handles operate at right angles to ways of lathe bed.*

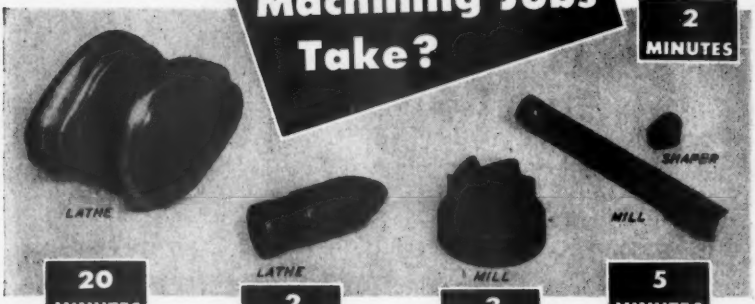
MODEL No. 2

Write for the new Allison catalogue or SEE YOUR LOCAL DISTRIBUTOR.

TOOL AND ENGINEERING CO.

4031 WHITTIER BLVD., LOS ANGELES 23, CALIF.

# How Long Should These Machining Jobs Take?




20 MINUTES

2 MINUTES

3 MINUTES

5 MINUTES

2 MINUTES

## New Production Records!

The above examples of machining-time on parts of irregular or eccentric shape or contour will give you an idea of how much you can speed up your production of similar parts by equipping your machines with Turchan Follower Attachments.

In nationwide use on lathes, shapers, grinders, planers, boring mills and milling machines, the Turchan has enabled leading war plants to perform machining operations 3 to 20 times faster—rolling up production records which seemed almost impossible. It will do the same for you—not only on wartime production but on peacetime production as well.

If you would like to know whether your machining-time on any part can be reduced by using a Turchan Attachment, send sample or blueprint and we'll give you the low-down!

*"Turn to Turchan"*

**SEND**

Sample or Blueprint of Parts for

**PRODUCTION ESTIMATE**

**TURCHAN**

**TURCHAN FOLLOWER MACHINE CO.**
**8257 Livernois - Detroit 4, Mich.**

*Hydraulic Follower Machine*

Radiform
TRADE MARK REG.

*The ability to produce....*

**ACCURATELY and FAST!**

Small parts? You name it . . . we'll make it! Our diversified equipment is ideally suited to the quantity production of precision parts, a task entirely removed from our production of Authenticating Gages and Special Tools, but marked by the same care and accuracy. If you need precision parts, write us!

GO PRECISION AUTHENTICATORS NO-GO

**ELECTRIX** *Corporation*

Peacetime engineers of soft-rubber connectors for electrically-operated equipment, sold exclusively through U. S. RUBBER CO.

156 MIDDLE STREET • PAWTUCKET, R. I.

# NEW... Acro NEEDLE EYE LAPS For Small Diameters

## Exclusive *Barrel-Shaped* "SLIT" Lap Prevents Bell-Mouthing of Small Holes

Small holes, straight or tapered, can now be more accurately finished with Acro Needle Eye Laps. These new, scientifically designed, tested and proven "slit" laps finish any type of small hole with a total elimination of bell-mouthing which is commonly caused by split-end laps.

Like the eye in a needle, the slit is supported at both ends by solid metal and can be spread to meet size requirements. This feature also provides a resilience that eliminates freezing against the work.

Acro Needle Eye Laps were designed by men like yourself, seasoned in the field of precision manufacture. And it is with their assurance, gained from their own experience, that Acro Needle Eye Laps will provide the best in lapping today.

## TWELVE SIZES—EACH CAN BE EXPANDED TO MEET NEXT LARGER SIZE LAP

Small holes which may be finished with Needle Eye Laps range from .062" to .250" diameters. Simply choose a lap that is slightly smaller than the hole that is to be finished. Then spread the slot as desired with the special expander illustrated at right. Expanders are included with each shipment.

Acro Needle Eye Laps come in twelve sizes, and are packed a dozen of a size to a package. Each size can be expanded to meet next larger size.

Lap sizes: .062, .070, .079, .090, .104, .120, .135, .155, $1.50 dozen, $16.95 gross.

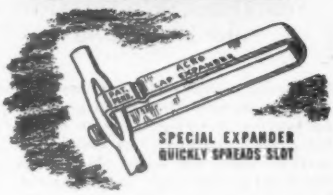
.1718 and .1875—$1.80 dozen, $20.50 gross.

.2187 and .250—$2.20 dozen, $25.10 gross.

Complete Assortment $18.95 gross.

REMEMBER—it's the barrel-shaped, closed end SLIT lap that turns the trick . . . eliminates bell-mouthing.

## ORDER NOW—IMMEDIATE DELIVERY




Leading jobbers throughout the nation have ample stocks of Needle Eye Laps on hand in all sizes to make same day shipments.

See Your Jobber or Write —

**ACRO TOOL and DIE WORKS**

4894 N. Clark St. Phone Longbeach 1807 Chicago 40, Ill.

# *Now* - THREE WEEKS DELIVERY *of* MAGNA-SINES

## FOR FAST, ACCURATE GRINDING SET-UPS

The constant demand for Magna-Sines has brought about production operations in the Robbins plant that now make possible a much greater and steadier volume than in months past. As a result, much faster deliveries can be promised—with practically all models being shipped within three weeks after the order is received. Now you have the opportunity to take immediate advantage of the many time-saving, money-saving features of the Magna-Sine for your angular grinding work.

*of*

## ROBBINS SINE PLATES

### FOR ANGULAR INSPECTION AND JIG BORING

The same prompt deliveries apply to these non-magnetic Sine Plates produced by Robbins. Not only are these models being used extensively for angular inspection work, but many plants have found them invaluable for jig boring. Like the Magna-Sine, they are available in two sizes in both single and compound angle types. For full information, see your Robbins representative or write directly to the factory.

## ROBBINS ENGINEERING COMPANY

318 MIDLAND AVENUE • DETROIT 3, MICHIGAN

# WHAT HAS THIS TO DO WITH *broaching?*

ONE of the earliest and most important engineering discoveries of all time was the lever, whose force potential moved a wise ancient to declare that . . . if given a lever large enough, and a star to serve as its fulcrum . . . he could move the world! Although, in its pure form, an earth-moving lever is impractical, the lever today performs, almost unrecognized, a multitude of useful functions. Its truly earth-moving potentialities are to be found in the lever's formula of power application . . . energy + ingenuity = efficiency!

It seems a far cry from the claw hammer to a huge rolling mill, where huge red-hot ingots are transformed as if by magic, into wafer-thin sheets . . . yet the principle remains constant. You couldn't beat out miles of thin steel plate with a carpenter's hammer . . . nor could you pull out a hard driven spike with your fingers. Both are examples of the lever's theory that a minimum of energy correctly applied can not only move the world . . . but can make the world a better place to move in,

BROACHING is a further development of this principle. Eliminating needless operations and speeding up production, it requires *less* energy to produce *more* . . . resulting in fewer man and machine hours to produce each part. Parts mass-produced in a fantastic variety of complex shapes and sizes to uniformly close tolerances. It will pay you to investigate the possibilities of broaching in your plant.

Just as Lapointe pioneered in the designing of broaches and broaching machines for the mass production of precision parts . . . so too, will Lapointe continue in its quest to make better things for a better world . . . quicker and cheaper!

*Earliest use of broaching principle on this continent was by soldiers of the Revolution, who drove steel balls through heated rifle barrels to give the correct bore.*

The LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.

PRODUCERS OF BROACHING MACHINES

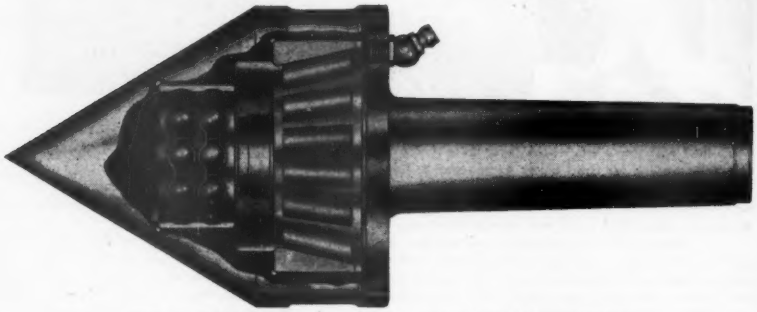
# MARVECO

## THE OLD TIMER

**Recently we ran into him in a midwestern plant. Our engineers were making an initial installation of Marvecos. Old Timer wanted a runout check made, and when his .0001 indicator failed to show any runout, he insisted that the indicator was wrong because, "no darn live center can run that close".**

**He now insists on Marvecos.**

***Have you tried your Marveco yet?***



***The MARVECO is GUARANTEED to OUTPERFORM and OUTLAST any other LIVE CENTER.***

***. . . Let us prove it! . . .***

**SEND US YOUR CENTER PROBLEMS**

**MARVEL TOOL & MACHINE COMPANY**

***Exclusive Manufacturers of MARVECO...The Live Center***

**10973 W. JEFFERSON, RIVER ROUGE 18, MICHIGAN**

How can

# CUT the COST of PRECISION

Looking into the near future, it is easy to see that the new and precise standards of accuracy of the past few years will become regular practice in all industry.

And yet, competition will demand that these standards be maintained at low production cost.

For help in meeting this situation

## Use PM Cutting Tools

PM Inserted-Blade Milling Cutters and Ground-Thread Multiple Thread Mills have proved their ability to turn out long production runs with accuracy of dimension maintained from start to finish. Their sound design and careful building insures longer effective life without loss of precision.

## Use PM Gages

Gages bearing the PM Diamond Emblem promise you the utmost in accuracy, and then live up to that promise. Careful finishing slows down gage wear and helps you uphold high standards and close tolerances.

When you retool for new production, let Pipe Machinery engineers help you.

ARMY E NAVY

The PIPE MACHINERY COMPANY Cleveland, O

# Tannewitz DI-SAWS

## have LARGER CAPACITY, saw *Easier*, STRAIGHTER

In making inside and outside cuts on dies, tools, jigs, etc., as well as inside and outside filing and polishing, the modern die saw will save upwards of 70 per cent of the time required by ordinary methods and reduce costs proportionately. Don't overlook this great opportunity to step up both production and profits. But be sure to get the machine that gives you the added advantage of EXTRA CAPACITY (a full 24 inches between the blades) and the easier and straighter cutting that naturally follows from the use of larger wheels. Get the complete facts concerning the TANNEWITZ M-24, the most highly developed die saw on the market. Simply write for our DI-SAW Bulletin. Also describes larger DI-SAWS for special applications.

Other bulletins on request: Single and Variable Speed Foundry Band Saws, SHEET METAL CUTTING Band Saws.

**THE TANNEWITZ WORKS, GRAND RAPIDS, MICHIGAN**

# ONE MAN HANDLES DIES UP TO 3000 LBS!

With the new BARRETT MULTI-DUTY DIE TABLE, one man does everything! Here's a lifting table, work bench, die separator, and floor truck—all in one—designed to save time and energy; cut costs in storing, moving and setting up dies. Note these outstanding advantages:

1. Makes die separation and assembly a simple, one-man job.
2. Handy crank-operated hoist does the heavy lifting.
3. Table is adjustable to height from 24″ to 40″ above floor.
4. All gears are accurately machined and fully enclosed.
5. Husky all-steel construction; electric welded, rigid.
6. Easy to operate; no complicated parts to give trouble.
7. Rolls easily on heavy-duty ball bearing casters.

Offered in two sizes with 44″ x 28″ and 36″ x 24″ tables; safe load capacities from 2,000 to 3,000 pounds. Write today for descriptive bulletins.

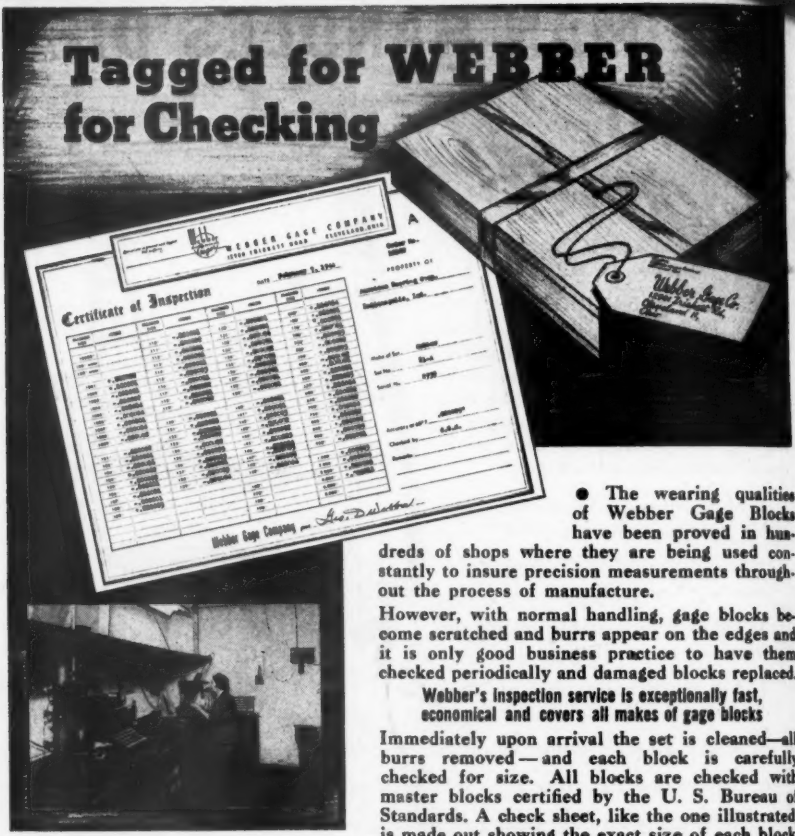
BARRETT-CRAVENS CO., 3269 W. 30th St., Chicago
*Representatives in All Principal Cities*

**BARRETT**

ONE MAN DOES MORE THAN 3 OR 4 . . . WITH A BARRETT LIFT-TRUCK

Barrett Handling Equipment

# Tagged for WEBBER for Checking






● The wearing qualities of Webber Gage Blocks have been proved in hundreds of shops where they are being used constantly to insure precision measurements throughout the process of manufacture.

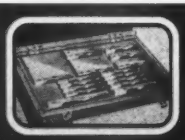
However, with normal handling, gage blocks become scratched and burrs appear on the edges and it is only good business practice to have them checked periodically and damaged blocks replaced.

**Webber's inspection service is exceptionally fast, economical and covers all makes of gage blocks**

Immediately upon arrival the set is cleaned—all burrs removed—and each block is carefully checked for size. All blocks are checked with master blocks certified by the U. S. Bureau of Standards. A check sheet, like the one illustrated, is made out showing the exact size of each block. This sheet is returned to you with a recommendation for replacement of any badly worn gages and a quotation on the cost of replacement. You can then advise us to make the replacements and we will make a 10% allowance on all worn gages replaced. Otherwise we will, at your suggestion, return the set making a nominal inspection charge. That's all there is to it.

Our experience indicates that it is not only more economical to replace worn blocks with new but considerably more satisfactory than any reconditioning scheme.

Send your gage blocks, regardless of make, to Webber for checking and insure the continued accuracy of your product by the guaranteed accuracy of your gage blocks. For any further details consult Webber Gage Co.



**Webber**
**GAGE COMPANY**
12903 TRISKETT RD. • CLEVELAND 11, OHIO

# The ONLY HEAD that takes 'em all!

## The UNIVERSAL PRECISION INDEXING HEAD

**Can be used on any tool or surface grinder. It holds all the tools shown below. Graduated 360° in 3 planes, for every simple or compound angle. Prompt delivery.** ***Write for illustrated circular C and complete story.***

1 Holds straight shank tools up to 1" diameter in standard Hardinge Full-In collets (Type 1-AM).
2 Quill is ground to hold No. 4 Morse Taper tools.
3 With conversion sleeve (furnished) holds tools up to No. 9 B & S Taper.
1
2
3

# CLEVELAND

## TOOL ENGINEERING COMPANY

1261 C WEST 4th STREET • CLEVELAND, OHIO

## SERVICE NOW—TOOL DESIGN AND CONSTRUCTION

Right now, we are in a position to accept additional contracts in our Tool and Die Design and Construction Departments. We invite telephone, telegraphic or mail inquiries and submission of prints.

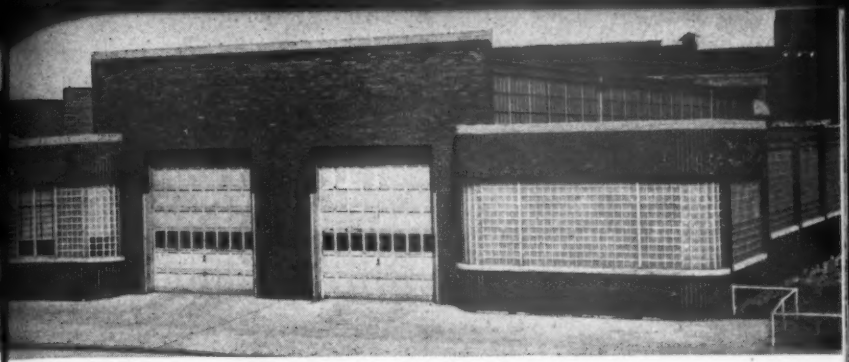
A shop that is equipped as we are to see a job through from drawing board to finished product is like an individually skilled craftsman—able to do the job most efficiently.

For 24 years, in war, as in peacetime, our experience and know-how, our modern facilities and equipment, have assured quality work. From our Engineering Department to our final inspection, these facilities and equipment and our highly skilled manpower have been so varied as to permit **exacting precision service.**

Your inquiry will receive prompt attention. Estimates furnished without obligation. Send for our folder B-823 listing complete facilities.

# THE BUNELL MACHINE & TOOL COMPANY

1601 EAST 23RD STREET • TELEPHONE CHERRY 0343 • CLEVELAND 14, OHIO



*Chamber of Commerce award as the best small industrial plant completed in 1941-42.*

A section of our Engineering Department in which special tools, dies, jigs, fixtures, gages and special machines are designed

DESIGNERS AND MANUFACTURERS OF

Tools • Special Machinery • Dies • Jigs • Gages • Fixtures

PRECISION PRODUCTION OF PARTS AND ASSEMBLIES

# INSPECTION

**Inspection, like other precision procedures in the contract shop, has kept pace with increased production. Closer tolerances had to be met in spite of the enormous quantities of parts that the war program has demanded and keeps demanding.**

**Obviously, some shops were more successful than others. We started with the "know-how" and we have kept up with new and improved inspection equipment, specialized training and a spirit in our shop that the old timers and the newcomers alike share, a spirit of determination to do our part of the job better and faster.**

**We still get as much kick as ever about getting a new customer. We'll do our best for you.**

*Designers and Builders*

**OF DIES • JIGS • FIXTURES • GAGES • SPECIAL MACHINERY • JIG BORING • PLANER EQUIPMENT**

**STAR MACHINE & TOOL COMPANY**

**9320 Woodland Ave • Cleveland 4, Ohio**

DIE CASTER FINDS MANY USES FOR DUMORE PRECISION GRINDER

**KEEPS PRODUCTION EQUIPMENT**

*Producing!*

Die cast parts supplied to several foremost manufacturers of quality products call for molds of extreme precision. Likewise, production schedules demand that all equipment be kept in efficient operating condition. Between these two classes of work, the progressive die caster finds numerous and varied jobs for his Dumore Precision Grinder.

Shown mounted on a lathe, it is grinding the plunger of a die casting machine. It is equally at home on milling machine, shaper and other standard machine tools, for either external or internal grinding. Its vibrationless operation and high speeds, (up to 42,500 r.p.m.) make it especially useful for internal grinding of small diameters. Scientific engineering and exacting manufacturing methods give the Dumore stamina to maintain precision to a tenth (.0001"), even in tough production schedules.

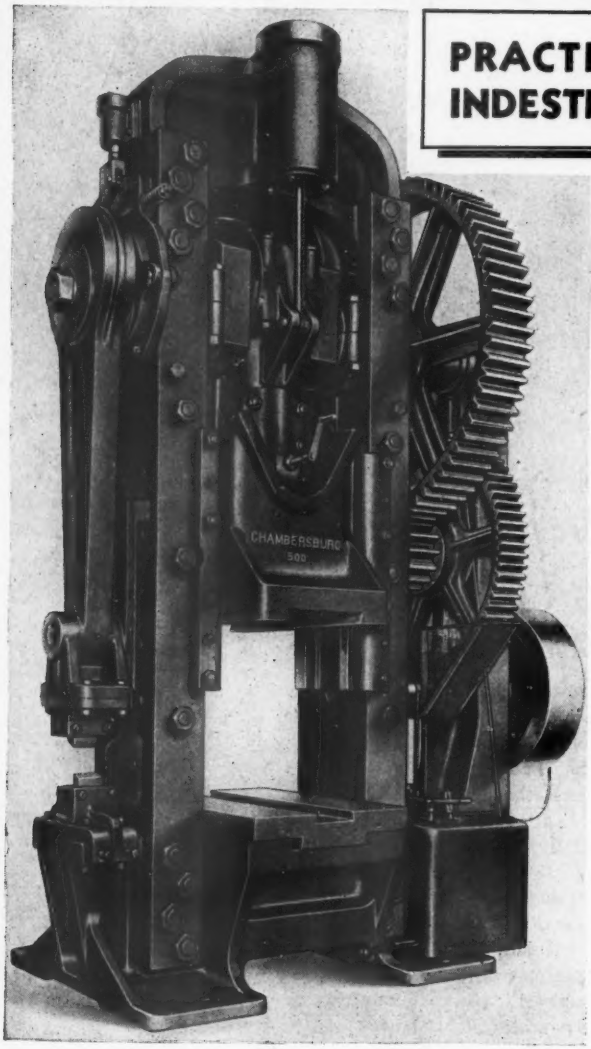
Check over your "precision requirements" with the Dumore distributor, or write for suggestions and copy of catalog to The Dumore Company, Tool Division, Dept. TJ42, Racine, Wisconsin.

*DUMORE*

**PRECISION AND OFF-HAND GRINDERS**

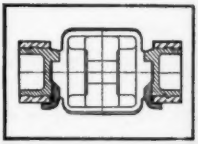
**SOLD BY AUTHORIZED INDUSTRIAL DISTRIBUTORS IN ALL PRINCIPAL CITIES**

# PRACTICALLY INDESTRUCTIBLE!




## A Remarkable Mechanical Press

**The Chambersburg Steel Side Press, in Single or Double Crank Types, was designed originally for trimming operations in Forge Shops. But its sturdy construction and patented Steel Side Frames give it a strength, rigidity and versatility that have greatly widened its application.**



### INTERLOCKING FORGED STEEL SIDE CONSTRUCTION
(PATENTED)

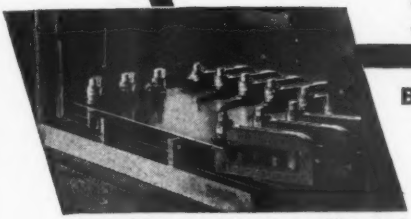
**Surprising strength and rigidity is attained by the side frame construction. The tongue-and-groove construction binds base, forged steel uprights and yoke into a rigid unit. Compare with non-rigid construction in other presses.**

**It is ideal for all forms of blanking, punching, binding and shaping operations. Easily accessible, front or back, protected by all the latest safety devices.**

**CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.**

**CHAMBERSBURG**
HAMMERS · CECOSTAMPS · PRESSES

# BEFORE YOU PUT HOLES IN
# SHEETS
# ANGLES
# CHANNELS

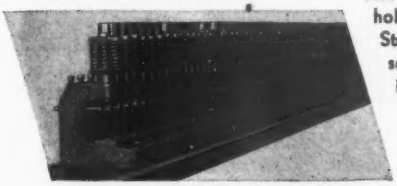


Wales Type "B" Units for punching sheet material in stamping presses.

## BY *any* METHOD . . . *investigate*

# WALES
## HOLE PUNCHING EQUIPMENT

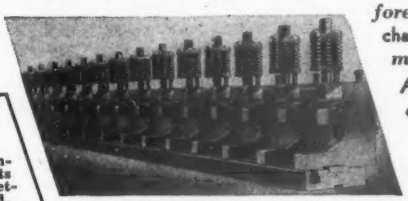
Before spending valuable time and effort designing and building special hole punching dies, check with Wales Strippit engineers who may have solved your particular hole-punching problems by using various adaptations of standard Wales Hole Punching Units.



Wales Type "C" Units designed for punching angles and sheets on press brakes.

Join the hundreds of metal fabricators who make it a rule of calling on Wales-Strippit *before* putting holes in sheets, channels, and angles *by any method.*

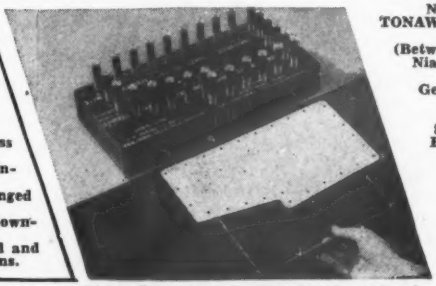
As a timely suggestion, call on Wales-Strippit *FIRST.*



Wales Type "E" Units to punch extruded shapes and channels on press brakes.

**TIME-SAVING, MONEY-SAVING FEATURES**

1. Usual time-consuming adjustments of conventional set-ups are eliminated.
2. Punch and die held in perfect alignment by holder.
3. Each unit is independent and self-contained.
4. Straight line, staggered or scattered patterns punched with same units.
5. Same group of units may be used interchangeably on press brakes and stamping presses.
6. Nothing attached to press ram.
7. Individual units may be instantly removed or reset.
8. Punches may be interchanged without disturbing set-up.
9. Die setting and press "down-time" reduced to minutes.
10. Same units may be used and reused in unlimited patterns.



Wales Plate Set System punches holes in sheets as close as ½" center-to-center *in any direction* over the entire sheet.

**WALES-STRIPPIT CORPORATION**
855 Payne Avenue
NORTH TONAWANDA, N. Y.
(Between Buffalo & Niagara Falls)
George F. Wales
President
Specialists in Punching and Notching Equipment

# FIRST BITE IN ANY FIGHT

SIEWEK-BUILT "PROGRESSIVE"

## SHEAR-CUT END MILLS

End mills must bite metal, before metal can fight.

Busy converting metals into American armament, Progressive Shear-Cut End Mills are cutting cleaner, faster and longer on the toughest jobs! Precision made of the finest materials, these end mills feed accurately, minimize chatter, give uniform cutting action and adequate chip clearance . . . permit working to extremely close limits.

Now manufactured by Siewek Tool Division of Domestic Industries, Inc. . . . Progressive "Shear-Cut" End Mills are the same high character product—with the *extra* resources and service of Domestic Industries, Inc.

When you need end mills, specify "Shear-Cut." They'll serve you long and well in starting your armament on the road to victory . . . as they have for so many others.

**SIEWEK TOOL DIVISION**
**OF DOMESTIC INDUSTRIES, INC.**
DETROIT (Ferndale Station) MICHIGAN

DI DOMESTIC INDUSTRIES

*Distributors in Principal Cities*

AFFILIATED WITH SIEWEK ENGINEERING DIVISION—CHICAGO • DETROIT • HARTFORD, CONN. AND SPRINGFIELD, MASS.—DESIGNERS AND BUILDERS OF TOOLS, DIES, JIGS, FIXTURES AND SPECIAL MACHINES

**WAR EFFICIENCY**
*that Carries Through to* **PEACETIME PRODUCTION**

# SIEWEK

**STANDARD RAPID CLAMPING DRILL JIGS**

Four E-2 Spring Type Siewek Jigs on a rotary table

● Now doing an outstanding job in war production, Siewek Standard Drill Jigs can be turned to new peacetime products easily. They are designed for conversion—the same change that makes each Siewek Drill Jig usable on a number of wartime products—the shift to another adapter and top plate.

Wide acceptance in war plants of these standard drill jigs is due to this feature, for it means a saving of time, material, labor and money. One Siewek Jig takes the place of dozens of special jigs, since simple adapters, as many as you need, fit the standard jig for a variety of jobs.

The shop using standard Siewek Rapid Clamping Drill Jigs will be in a position to keep up with sudden changes in product design. Having served so well on war production, these jigs immediately will be available to work on peacetime products when Victory is won.

*Contact a Siewek representative in your territory, or write us for Catalog No. 50 J describing 50 different sizes and types.*

Type C-L Rack and Pinion Jig

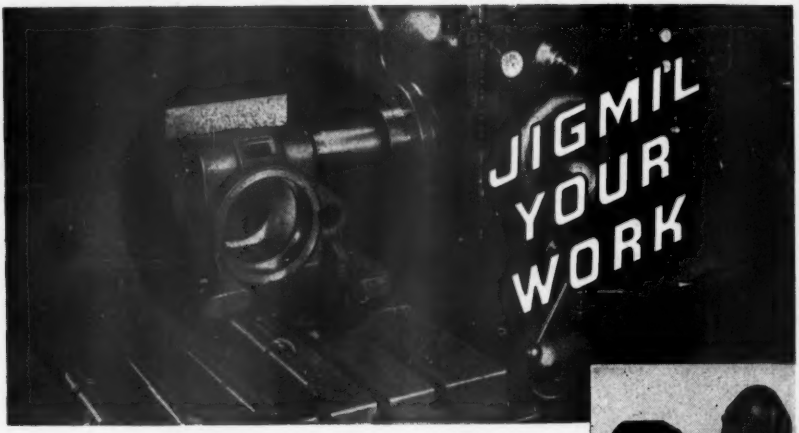
**SIEWEK TOOL DIVISION**
**OF DOMESTIC INDUSTRIES, INC.**
**DETROIT (Ferndale Station) MICHIGAN**
Representatives in Principal Cities

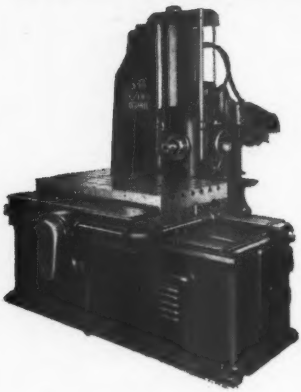
**Designers and Builders of**
**SHEAR-CUT END MILLS**

●

**Affiliated with SIEWEK ENGINEERING DIVISION**
a nationally known organization staffed with experienced engineers—Consulting, Processing, Designing and Fabricating
*Chicago • Detroit • Springfield, Mass. • Hartford, Conn.*

# JIGMIL for Faster, Better and more Accurate BORING and Milling Performance



The JIGMIL is a totally new approach to the problems of boring and milling, having dependable accuracy and ease of manipulation that eliminate the necessity for specialized skill.

The JIGMIL provides great economies on experimental and tool work.

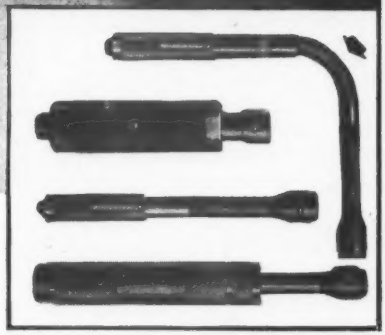
The JIGMIL does most production boring and milling work faster and more accurately with rugged tools working in the open than is possible with the part trapped inside the walls of a boring fixture.

*Two to three times faster than any other method.*

*Dependable accuracy and better finished holes than any other method.*

**DeVLIEG MACHINE COMPANY** DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

*Choice of*
**AMERICAN INDUSTRY**
**for DE-BURRING and**
**LIGHT GRINDING**
**and FINISHING JOBS**



Foredom Machines are employed in many thousands of manufacturing plants for grinding, finishing, polishing, de-burring, milling, cleaning, etc., replacing old-fashioned, time-killing hand methods.

Foredoms are used in 3 key departments—production—tool room—maintenance. Among the leading industrial plants employing Foredoms are Ford, General Motors, Chrysler, Nash-Kelvinator, Jack & Heintz, Sperry Gyroscope, Bendix, Westinghouse, etc.

Models from $17.50 to $48.75. Catalog No. 458 shows complete line and many uses—may point the way to solving some of today's production and maintenance problems. Write for your copy.

4 Quickly - interchangeable handpiece types—pencil size and larger—some with flexible wrist—see arrow.

For maintenance and emergency needs,—touching up set-ups without disassembly, removing high spots on gears, identification marking of equipment, etc

1

2

In die and tool departments, for grinding, finishing and touching up dies, molds, jigs, etc

*Another Foredom Time-Saver*

## GRINDING KIT

### Model 111

One of Foredom's complete line of versatile utility grinding kits preferred by so many plants for emergency and maintenance needs. You too will find it pays to spot them liberally about your plant. Pencil-size handpiece facilitates getting into tight corners for touching-up production set-ups. Complete with accessories $23.50.

3

For de-burring, grinding, finishing, polishing and other light production jobs—particularly valuable on irregularly-shaped parts

*Order from your regular Mill Supply House or direct.*
**FOREDOM ELECTRIC CO., 27 Park Place, N.Y. 7**

FOREDOM ELECTRIC COMPANY
27 Park Place, New York 7, N. Y.

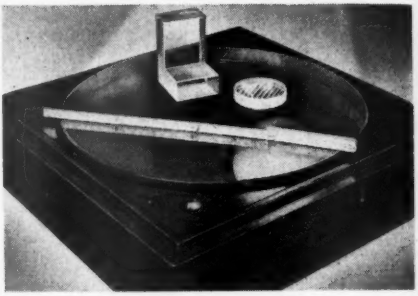
Please send us your new catalog No. 458 showing the different uses of Foredom Flexible Shaft Machines.

Name .....
Address .....
City .....
State .....

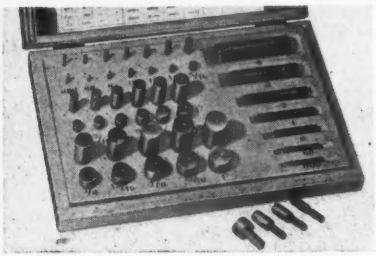
# GEORGE SCHERR PRECISION PRODUCTS

## Belong In Every Plant Doing Accurate Work

**The SCHERR Opti-Flat, the new glass surface plate, is guaranteed flat within 50 millionths of an inch. Here is the ideal starting point for the finest tool and die work, for establishing locations, for height gage scribing, for sine bar work. Available in 2 sizes, 12″ diameter 2″ thick at only $58.00. 16″ diameter and 3″ thick at $88.00. A WORTHWHILE investment for your shop. ORDER TODAY.**



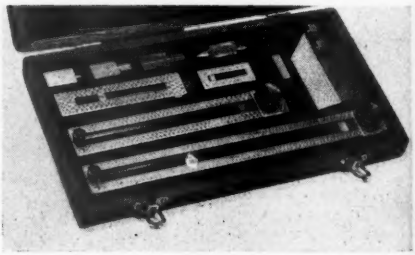
## For Emergency Use



**Here is a new idea to solve your Plug Gage problems quickly and inexpensively. Order now, the ATLANTIC EMERGENCY SET consisting of 36 oil-hardened plug gage blanks in steps of 1/16″ ready for finish grinding. You can make up any plug gage from .029″ up to 1.000″ in a few moments work on a cylindrical grinder. COMPLETE SET with 7 handles costs $67.50. Order now, or write for folder No. TD101.**

## Introducing Gage Block Utility Set

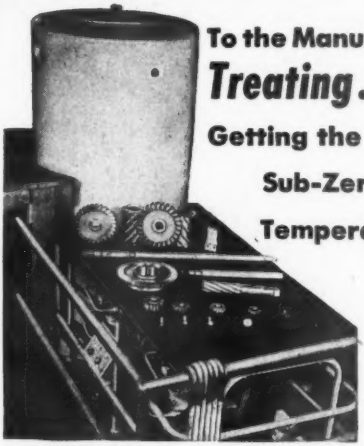
**The SCHERR Gage Block Utility Set consists of holders, jaws, scriber, center points and height gage base all designed to permit you to transfer gage block accuracy directly to your work. EVERY GAGE BLOCK USER WILL FIND THIS SET INDISPENSABLE. COMPLETE as shown $135.00 or write for folder TD-102.**



## GEORGE SCHERR CO., INCORPORATED

**200-B LAFAYETTE STREET • NEW YORK 12, N. Y.**

# To the Manufacturer Not Yet Using Cold Treating . . . Here's How Others are Getting the Advantages of Deepfreeze Sub-Zero Temperatures



**1 TREATING** Tools and Machine Parts in a Deepfreeze Cascade −120° F. Industrial Chilling Machine.

● Deepfreeze Industrial Sub-Zero Chilling Machines are being used daily to harden cutting tools, stabilize gauges, shrink steel parts for assemblies of various types and test aviation parts and instruments. The chances are that you can beneficially put all four of these cold treating operations to work in your plant. Here are a few of the results being obtained by manufacturers through the use of Deepfreeze sub-zero temperatures—Tool life on high-speed drills increased 500%; life of gauge blocks and lapping flats increased 2000%; $3,675 saved per year by eliminating the dry ice method of shrinking valve insert seats for engine blocks.

**How to Pre-determine Your Benefits from Cold Treating . . .** Deepfreeze Engineering Service will inform you without obligation of the benefits you will receive by applying cold treating to your production. Submit the details of your work today.

**FREE...Latest Cold Treating Facts...**

A new 40-page booklet has just been published on cold treating and will be sent to you upon request for Bulletin No. I-4.

**2 SHRINK FITTING** all types of metal parts for rapid assembly in a Deepfreeze Cascade −120° F. Chilling Machine.

**3 STABILIZING** gauges and gauge blocks to within .000002" in a Deepfreeze −120° F. Chilling Machine.

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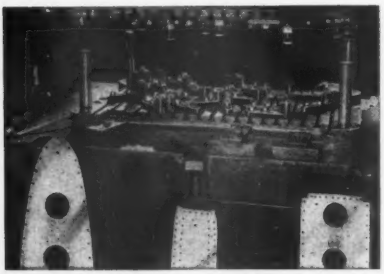

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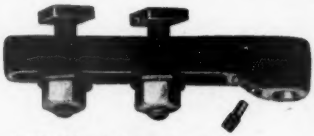
**These photographs show the simplicity of a Whistler Adjustable Punch and Die assembly. Every piece is interchangeable.**



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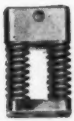

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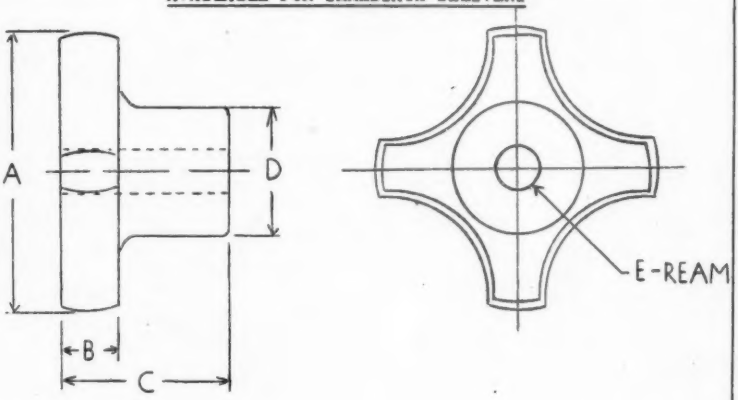


| HAND KNOB NO. | A | B | C | D | E | PRICE EACH WITHOUT HOLE | PRICE EACH WITH REAMED HOLE | PRICE EACH WITH THREADED H. |
|---|---|---|---|---|---|---|---|---|
| N-1 | 3/4 | 1/4 | 1/2 | 7/16 | 3/16 | .05 | .10 | .13 |
| N-2 | 1-1/8 | 5/16 | 5/8 | 9/16 | 1/4 | .07 | .13 | .15 |
| N-3 | 1-1/2 | 3/8 | 11/16 | 3/4 | 5/16 | .09 | .15 | .17 |
| N-4 | 2 | 7/16 | 13/16 | 7/8 | 3/8 | .12 | .17 | .19 |
| N-5 | 2-1/2 | 1/2 | 1-1/2 | 1-1/8 | 3/8 | .14 | .19 | .21 |
| N-6 | 3 | 1/2 | 1-1/2 | 1-1/8 | 3/8 | .16 | .21 | .23 |

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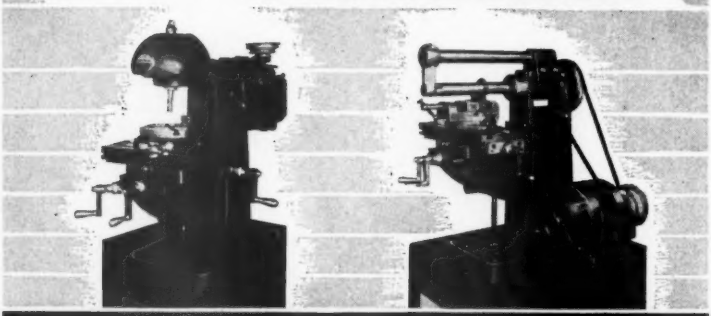

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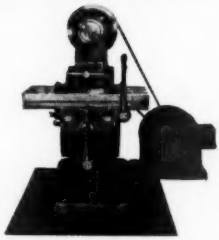

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"Design of Plastics Parts and Molds," Part II—by Warren V. Prince
"Estimating Plastics Molds," Part III—by Gordon B. Thayer
"Tool Room Surface Grinding," Part III—by J. E. Corbett
"Three-Dimensional Drawings"—by L. S. Sanders

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# A $500,000,000 INCENTIVE

Several months ago announcement was made by the General Motors Corporation that it expected to spend some $500,000,000 for new equipment and tooling. This would probably include large numbers of machine tools, presses, special tools, dies, jigs, fixtures, gages and the necessary complements of small tools. Comparisons are usually interesting, particularly when we may draw therefrom an indication of postwar production possibilities.

This $500,000,000 is slightly more than the total value of machine tools shipped by that industry in 1940, when the total was $442,633,000. It is almost 38% of the largest war year, 1942, but it is more than 2½ times the production in any peacetime year in the decade 1929-38. Another comparison that comes to mind is that the Contract Tool and Die Industry's annual output prior to the war years was estimated at about $400,000,000.

These comparative figures are of greatest interest when it is emphasized that they represent an estimate of one manufacturer's prospective purchases of production equipment and tools. In the interim since the corporation's estimate of postwar re-tooling expenditures it appears that under the direction of divisional works managers, master mechanics and plant managers, it had been making plans for much more efficient production. These included, of necessity, the careful consideration of machine tools and other equipment then in use—their designs, characteristics, and specific efficiency ratings. In the latter part of April, General Motors invited a group of representative machine tool builders to a *conference in Detroit, and subsequently there met the representatives of 65 of these manufacturers with the master mechanics and plant managers from practically all General Motors divisions, as well as some works managers and other executives. Prior to this, General Motors had set up electrical standards for the machine tools it expected to purchase. The discussion included these standards and numerous suggestions for improved machine tool designs and specifications as conceived by General Motors Plant executives, many of them born under the terrific stress of war production demands.

To us it seems that there has not been sufficient publicity given to this very constructive cooperative effort, and further because we know that many of our readers are vitally concerned about postwar machine tools and tooling, their use as well as their design and construction, we shall brief a portion of the report.

**Machine Tool Electric Motors: Location of motor on machine tool is important. Tucked away in frame compartments, they are frequently inaccessible and receive inadequate maintenance. Compartments when too small compromise ventilation and increase motor operating temperatures. Modern motors being pleasing in appearance and in any event the utility of a machine tool being more important

*Under direction of H. T. Johnson, Director of Standards, GMC.
**Report by C. J. Warner, Ass't. Chief Engineer, Delco Products Division.

than its lines, it was recommended that motors be located for ease of maintenance and servicing, and where replacement with higher rated motors in anticipation of increased cutting speeds and feeds would readily be possible.

The uniform use of totally enclosed fan-cooled ball bearing motors was recommended, with junction boxes entered from below to eliminate the possibility of flexible conduit becoming a downspout through which oil and coolants might enter the motor. Provide easy access to grease fittings, maintain good fits between motor shaft extension and coupling devices.

*Production Equipment Controls: Locate for maintenance of operator's normal posture and safety. Work area and all controls as near elbow level as possible, with size, weight, shape, leverage and balance intended for operation without undue effort. Provide toe space if operator stands, locate foot pedals for operation with either foot, thereby reducing fatigue; reduce foot pedal travel to a minimum so operator can maintain balance; replace hand controls with foot controls to free hands for other useful work; design single controls to perform multiple functions; replace hand operated knock-outs with automatic ejectors.

"How far should machine tool builders go in the way of increased feeds and speeds and heavier and more powerful machines?" It was the consensus of opinion of General Motors men that even though a thorough understanding of the new cutting techniques had not yet been developed, some machine tools were being operated to capacity. Therefore it was recommended that new machines should be designed to have spindle speeds, table feeds and power sufficient for forthcoming new cutting tool developments.

It was pointed out that chip disposal in some instances was proving serious, that supplementary sumps were being added to some machines, and that this provided an extremely important subject for study by machine tool engineers.

The reports which were read were factually illustrated with photographic slides, and specific examples of the difficulties encountered with equipment break-downs were given in a constructive effort to convince those present that design has much to do with the cost of maintenance. No one will take issue with the statement that American machine tools and production equipment have been efficient and effective. Industry's war record is ample proof. But it is acknowledged that war production demands for accuracy with large volume have been so insistent and strenuous that equipment design and construction weaknesses have frequently appeared at times when measures to overcome them were not only expensive but time-consuming.

Continuance of American Industry's supremacy after the war is a vital necessity. Duplicates of much of the equipment we are now using have been sold to other nations and today the designer and builder of every kind of tool making and production equipment looks forward to the improvements which he can make.

While at first blush it may appear that General Motors' action was overwhelmingly in its own interest, the fact is that the manner in which the suggestions were brought forward provides equal value for all machine tool builders, production equipment manufacturers, and eventually for all Industry.

*Report by G. J. Bates, Time and Motion Study Engineer, General Motors Corporation.

Geoff Huebner

*Editor*

# A PRECISION TOOL: THE SINGLE BLADE, PILOTED, EXPANSION REAMER

**by Albert W. Ehlers**
McQuay-Norris Mfg. Co.
Connersville Division

The necessity for closely machined, high precision, internal diameters presented many a headache to tool designers and production men whose peacetime products required only comparatively loose concentricity tolerances and a "good commercial finish". The advent of surface measuring instruments and the restrictions of micro-inch finishes made the "eye" and "pencil point" test of internal surfaces as obsolete as the paint-store yardstick.

Many, of course, had been familiar with internal diamond boring machines and extremely high speed internal grinding heads. However, the degree of priority for such equipment soon presented such a bottle-neck that production suffered due to the lack of available facilities.

### Prewar Precision Boring

The older precision diamond boring machines purchased prior to 1934 could approach close concentricity limits, but could not consistently produce a micro-inch surface finish below 12-13 micro inches. To subject a part to three finishing operations of rough and finish diamond bore and a final finishing with a high speed reciprocating grinding head ofttimes produced the surface finish desired, but the arithmetical accumulations of tolerances in the holding fixtures soon contributed to lost concentricity limits.

Many experiments were made by the writer on the older types of diamond boring equipment in an effort to consistently produce micro-inch finishes below 13. Spindle speeds, hydraulic feeds, diamond and carbide tool radii were altered individually and in all possible combinations, but consistent everyday production could not be achieved.

### The Single Blade Reamer to the Rescue

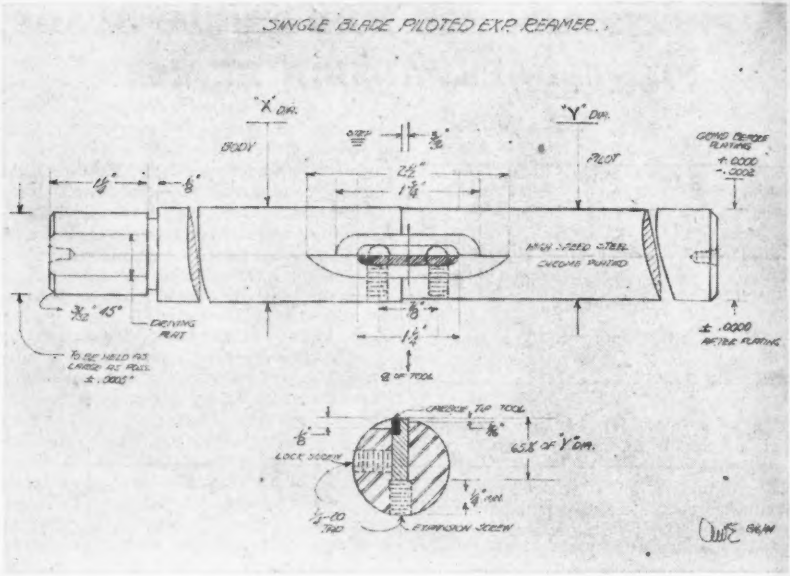
A particularly tough application on aluminum and bronze requiring a surface finish of below 13 micro-inches and concentricity of .0005" per inch full indicator reading resisted every effort toward consistent production until an old style tool termed the "Single Blade Piloted Expansion Reamer" was tried. This tool, in many variations of design, has been in use one way or another in many a tool and die shop for years. However, to the writer's knowledge, the application of this tool to production lines has never been investigated thoroughly.

The only machine requisites for this final finishing operation are a good heavy spindle drill press with an automatic feed and a well designed and located floating holding fixture for the work piece.

Preliminary boring procedure on the piece may be accomplished in any acceptable manner so as to hold concentricity limits to at least .001". If no equipment is available for precision boring, a double operation on the drill press must be resorted to in the cases of "rough" and "finish" single blade reaming.

### Construction

The accompanying drawings of the single blade reamer bar and the inserted tools are self explanatory. Several types of steel were tried on the bar itself in an attempt to produce a bar which would hold a flash plate of hard chrome of .0002" in order to resist chip galling which would mar the finish. It was finally determined by tool life comparison tests that an 18-4-1 tool steel had the longest life. For the manufacture of




such a tool the following instructions were given:

The reamer bar is turned, milled, and tapped as indicated, leaving at least .010" on the OD for finish grinding after heat treatment, or stock enough to correct any distortion of either furnace or quench. Rough grinding on a cylindrical grinder should be performed with a 3860L5BE wheel, and finishing grinding with an 3880L5BE wheel on the last .001" of stock. Extreme care should be exercised in eliminating taper and grinding checks. Both step diameters should be ground .0002" below indicated dimensions to accommodate a flash plate of hard chrome of the same .0002" stock removal. A flash plate of this thickness can be accurately controlled, and the thin plate of chrome not only assists in the lubrication of the pilot, but, if carefully watched for wear, prevents the marring of the high speed steel surface of the bar itself. If the chrome becomes worn or scratched it can be stripped and replated without regrinding the bar. However, if the bar is scratched below the chrome a light grinding cut will be necessary with a consequently heavier chrome plate.

In general, the "X" diameter of the finishing bar should be .0002"-.0005" under the low limit of the ID to be finished. The "Y" diameter of the pilot should be .0002" less than the "X" diameter. The length of the pilot should be commensurate with the depth of the hole to be finished. In general, this should be one and a half times the required depth. The cutting shank, or diameter "X", should be long enough to clear the entire length of hole with the inserted blade by at least ⅛" so that stops may be adjusted.

If a roughing reamer is needed to correct a bored hole or to prepare a bored hole, all OD dimensions should be .0015" smaller than the required dimensions of the finishing reamer. It should be noted that the inserted blade for the roughing reamer is of a different profile from either of the finishing reamer blades.

### Operating Procedures

In actual production, the holding fixture should be located accurately, and should have a very easily accomplished float without much friction. This will permit the pilot of the reamer bar to adjust the work piece to the axis of the

drill press spindle without side friction on the pilot.

It is extremely important on aluminum and bronze to provide a good stream of lubricant solution to both the entry and exit of the hole with copper tubes and under good pumping pressure. This will not only lubricate but will clear minute chips from the inserted blade, thus preventing scratching of both the work ID and the surface of the reamer bar.

A good standard lubricating solution is 10 parts light spindle oil such as D.T.E. Medium with 100 parts kerosene. This may be varied somewhat for appearance of finish required; more oil will dull finish on aluminum and bronze.

Spindle speeds should start at 160-180 sfm. High silicon aluminum requires a 25-300 sfm. This may be adjusted to produce the best micro-inch finish. Feeds should start at .009"-.012" per revolution, and also may be adjusted to fit the case. Bronze usually will respond to higher feeds and speeds than aluminum.

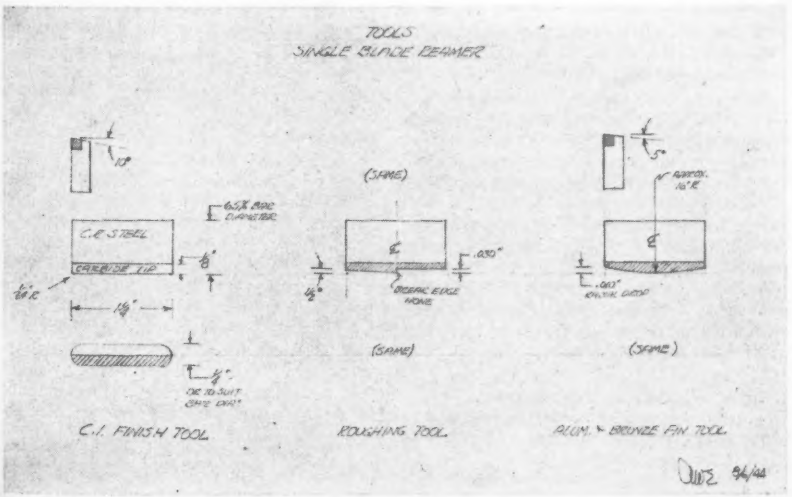
In machining cast iron the difference in finishing tool profiles should be noted. In most cases the machining can be accomplished dry. However, well directed jets of compressed air should be used to clear inserted blade of dust or chips. If the ID is of unusual depth, a solution of 20 parts soluble oil to 100 parts of water may be used as indicated in the aluminum and bronze set-ups. Relative to both solutions indicated, they must be kept clean and changed frequently to prevent the carrying of metal dust and chips.

Micro-inch finishes of from 6 to 10 are maintained easily on aluminum and bronze, and, if a two spindle drill press is used, thus permitting the operator to load one spindle while the other is machining, a very fast operation results.

This tool has been tried on "green" and "carburized" steel, but the results were not favorable due to the heavy cutting pressures destroying pilot finish. Steel also does not respond to the shaving and burnishing action of the tool itself as do the softer metals. At present, the only solution to low micro-finish ID holes in steel seems to be honing.

The size of holes that can be reamed depends upon the smallest diameter bar that can be made by the process illustrated. Holes from .750"-5.000" have been reamed successfully by the writer.

This article has tried to point out a method of employing the "Single Blade High Finish Piloted Expansion Reamer" in everyday production. It is hoped that the reader will respond by giving the method a test, and, furthermore, that he will experiment on particular applications to provide a more specific tool than is indicated by the accompanying sketches.



# TOOL ROOM SURFACE GRINDING—Part II

by J. E. Corbett

### Parallel Surfaces

After an operator learns to develop truly flat surfaces, he must be able to make opposing surfaces parallel. In addition to the internal strain and heat distortion problems already discussed,* the only other problem of this next procedure is the geometry of the operation.

Since it is not always practical to keep the holding surface of a chuck cleanly dressed and in a plane parallel to the plane of the table motion, some simple means must be found to correct any off condition of the chuck. These means are "Magnetic Parallels" such as shown in Fig. 7. Magnetic parallels are expendable tools and are made of steel strips laminated with strips of a non-ferrous or non-magnetic metal—usually brass. The strips are generally $\frac{1}{16}$" to $\frac{1}{8}$" thick and are riveted together to form blocks as shown. These parallels are used as secondary chucks.

For example, place a magnetic parallel on the chuck and grind the top surface of the parallel flat. It thereby becomes a plane surface and is parallel to the plane of the table motion and as long as it is not moved nor marred it will serve as an accurate auxiliary chuck for grinding opposing surfaces truly parallel. The advantage of magnetic parallels is that they present smaller areas for dressing and, of course, they eliminate the need for frequent dressing of the chuck.

Never use a magnetic parallel in a new position without cleaning up its surface with the wheel and note that its plates must be parallel to the magnet poles of the chuck. It cannot be used with its plates bridging opposing poles of the magnet. Also remember that these parallels do not hold the work with as much power as when it is placed directly on the chuck, so they are generally used only for light or finish grinding.

*See "Tool Room Surface Grinding", Tool & Die Journal, August 1944, page 89.

### Squares

A right angle may be developed and checked by reference to a cylindrical square.* While a tool of this type is not as convenient to use as a conventional square, it tends to be stable for size and shape and its principal use is to serve as a reference for checking the accuracy of the more commonly used blade or knife edge type of squares. The latter are subject to shop wear and often get damaged so that a cylindrical square is required for their maintenance.

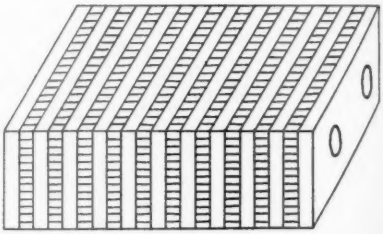


Fig. 7

Cylindrical squares are made of solid steel or of counterbored tubing with end plates welded in place. The assembly is welded, centered, rough turned, hardened, drawn, and aged by heating and chilling. The square is then finished by grinding the surface truly cylindrical and the ends truly square. Its accuracy in these respects can be checked at any time between centers and with an indicator. The set up for this precision test necessitates that the indicator travel on a truly flat surface and/or in a line

*For the basic method of producing self-proving right angles, see "Accuracy and The Geometry of Precision", Tool & Die Journal, February 1944, page 102.

that is dead parallel to the common axis of the centers. It is then easy to determine whether the square's surface is a truly cylindrical surface of revolution about the axis of the centers and whether the ends of the cylinder are dead square to the axis of revolution. While making a cylindrical square is not a surface grinding job, it seemed worth while to describe the purpose and construction of such an essential tool.

### Grinding Mutually Square Surfaces

To "square up" rectangular work is another matter. One method is to clamp the part to be squared on an angle block and grind it in that fashion. This requires an angle block that is square in all respects.

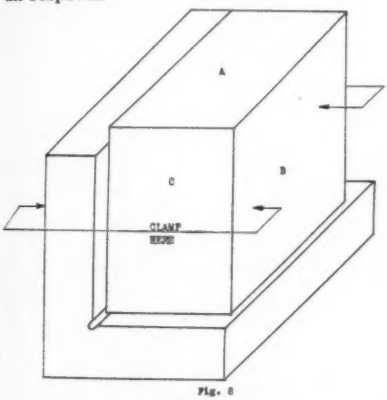


Fig. 8

### Procedure I

1. Rough grind all six sides.
2. Finish grind the two largest sides (B and the side opposite B) so that they are flat and parallel. Use a magnetic parallel and check for flatness with a knife type straight edge.
3. Clamp one finished side to one leg of the angle block as shown in Fig. 8 and finish the top surface A.
4. Stand the angle block on end and clamp the work as shown in Fig. 9 with the surfaces A and B next to the angle block. Finish grind the top surface C which will now be at a right angle to the other three finished surfaces.
5. Finish grind the sides opposite A and C flat and parallel to A and C respectively. Now each surface should be perpendicular to its adjacent surfaces.

The error resulting in squaring work as described above will equal the inaccuracy of the angle block plus (or minus) any errors which creep into the setup.

Another method, illustrated in Fig. 10,

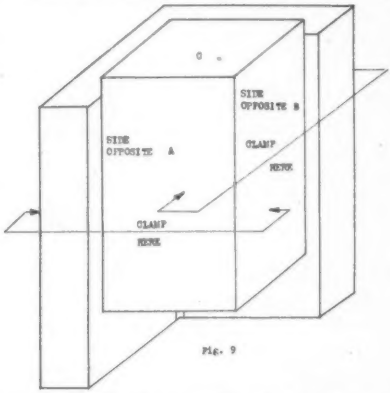


Fig. 9

is sometimes handy when it is not necessary to square the ends with the other four sides.

### Procedure II

1. Rough grind all six sides.
2. Grind the two largest opposing sides (B and C) flat and parallel.
3. Place the work on a piece of ⅛" drill rod with the finished sides (B and C) between two square setup blocks. Clamp the work firmly between the blocks and turn on the chuck power.
4. With light cuts, finish the top surface A. A will now be square with the surfaces B and C.

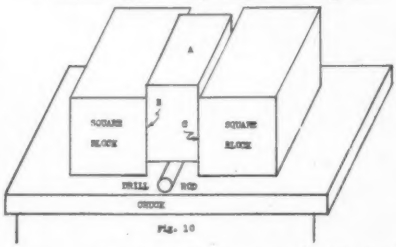


Fig. 10

5. Put surface A on a magnetic parallel and grind the opposite side flat and parallel. The accuracy of this method depends on the condition of the chucks, the trueness of the square blocks and the firmness of the setup.

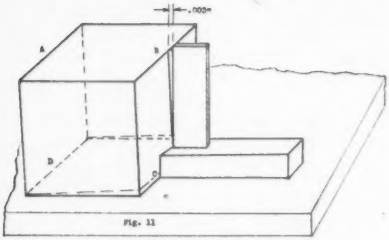


Fig. 11

Where angle plates, square blocks, vises, etc., are not available, the following method is used. See Figs. 11, 12, and 13. Notice that the letters A, B, C, and D represent edges, rather than corners or surfaces; and assume that the block to be squared is roughly a cube, hence its edges are approximately equal in length.

**Procedure III**

1. Rough the block all over and take finish cuts on the four surfaces between AB, BC, CD, and DA. Use a magnetic parallel so that the opposing sides will be parallel.

2. Put the block on a surface plate with the side CD down and check with a square along BC. Fig. 11.

3. Measure or estimate the opening at B. Suppose that it is .003".

4. Observe that material must be removed from CD beginning with .003" at C and tapering to zero at D (see dotted line at the bottom of Fig. 11) in order to close the .003" gap to the square at B. The thickness of the wedge to be removed from the base depends on the relative lengths to the two sides. Here we have assumed they are of equal lengths, hence the stock to be removed equals the width of the gap. If DC were half as long as BC, then only .0015" would need to be removed from the edge C to make that corner square and to close the gap at B.

5. Stand surface AB on a magnetic parallel and grind .003" from surface CD over to within $\frac{1}{16}$" from the edge D.

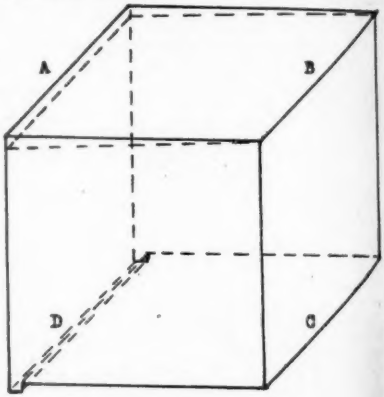


Fig. 13

See Fig. 12.

6. Stand the work on edges C and D and check again with the square along BC.

7. If not square, lap or grind edge C or D, whichever is indicated.

8. Grind AB parallel to the supporting edges C and D. This makes AB square with the sides BC and DA which were parallel. The dotted lines at the top of Fig. 13 shows the cut taken to make AB parallel with the supporting edges C and D.

9. Grind CD flat and parallel with AB.

10. Square the other angles in the same manner.

Some experience with this makes it a relatively easy, simple and accurate process. For setup it depends only on a trued magnetic parallel and the end accuracy depends only on the operator's ability.

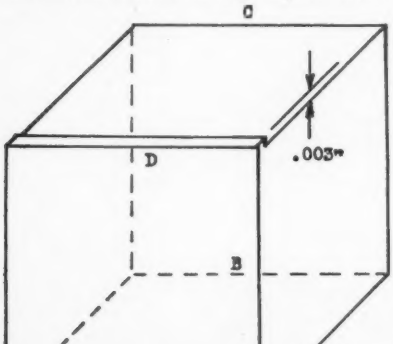


Fig. 12

## American Society for Metals 26th Annual National Metal Congress and War Conference Displays

**Marcus A. Grossmann, President, American Society for Metals.**

**Dr. Kent R. Van Horn, President-Elect, American Society for Metals.**

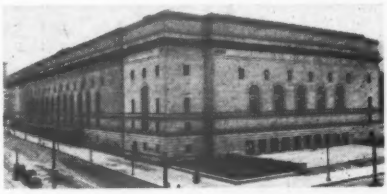
An inventory of information and developments in the metal industry will be made in a series of twenty-one practical panel meetings sponsored by the American Society for Metals during the 26th annual National Metal Congress and War Conference Displays in Cleveland's Public Hall, October 16-20. These practical sessions will be in addition to the regular technical lectures of the Society. Headed up by a panel of three to ten top authorities in specific branches of the metal industry, each of these afternoon and evening sessions will be an audience-participation discussion of timely developments. These meetings will take stock of new technologies developed during the war, will analyze and evaluate production-speeding wartime equipment — all this in a coordinated effort to knit these developments into a compact design for an efficient peacetime tomorrow in the metal industry.

Subjects scheduled for specific discussion during the five-day sessions are: metal powders and products; metals for railroads; metallurgical furnaces; induction heating; heat treatment; manufacture of quality steels; national emergency steels; surface peening; foundry metallurgy; quality control by statistical methods; salt baths; sub-zero treatments; surface finishes and protection; new developments in the study of corrosion; application and use of quality control instruments; tin and tin alloys; aluminum; magnesium; metal cutting and tool materials; tools for inspection; and lightweight construction.

In addition to the American Society for Metals, sponsor of the Metal Congress, participating societies are the American Welding Society, the Iron and Steel and Metals divisions of the American Institute of Mining and Metallurgical Engineers, the American Industrial X-Ray and Radium Society and the Society for Experimental Stress Analysis.

More than 325 manufacturers, state and civic organizations are planning exhibits that range from ferrous and nonferrous metals to processes and equipment for their production, fabrication, handling, treatment and use.

The American Society for Metals will receive the Ordnance Distinguished Service Award in recognition of its contributions to the war effort, according to word received by national secretary W. H. Eisenman from Major General L. H. Campbell, Jr., Chief of Ordnance. The award recognizes the Society's overall efforts to speed war production through metals education and training work. Especially noted were A.S.M.'s courses for the training of inspectors and its publication at cost of the textbook, "Inspection of Metals."



**W. H. Eisenman National Secretary of the American Society for Metals, and Managing Director of the National Metal Congress and War Conference Display to be held in Cleveland's Public Hall, October 16-20, 1944.**

# 1919 — 1944

# EX-CELL-O

# SILVER JUBILEE

In the past twenty-five years there have come out of the United States technological developments that have affected the whole world, and which, it is now being demonstrated, could well insure the peace and security of the whole world for generations to come.

**Phil Huber**

**Ex-Cell-O's President and General Manager**

In the first World War precision production was in terms of tolerances of thousandths and occasionally ten thousandths of an inch.

Today's World War II is being conducted on the industrial front by the precision production of articles of war whose dimensional tolerances are commonly expressed in terms of a few millionths of an inch.

This period of twenty-five years of increasing manufacturing refinement has been sparked by opportunities of industrial and personal incentive, enterprise and resourcefulness.

Paralleling this era, the Ex-Cell-O Corporation has participated in and contributed much toward these developments.

The beginning of the Ex-Cell-O Corporation was the Ex-Cell-O Tool & Manufacturing Company which was incorporated on July 10, 1919, and which occupied 2375 sq.ft. of floor space on Detroit's Beaubien Street.

An important part of the new company's early production consisted of drill jig bushings and they aimed at a complete line of standardized, hardened, and precision-ground bushings. Cooperating with other bushing manufacturers, Ex-Cell-O played an important part in the ultimate establishment of drill jig bushing standardization throughout the metal working industry.

The production of precision parts as well as jig bushings led to other fields of endeavor and research. Internal grinding was such an important operation in the production of satisfactorily finished bushings to close tolerances that Ex-Cell-O developed its own ball bearing with which all Ex-Cell-O precision grinding spindles produced since 1923 have been equipped.

Drill bushing manufacture and the development of internal grinding techniques had a lot in common with the pins and bushings used in railroad locomotives and passenger cars. Consequently, in pioneering the adoption of standardized hardened and ground steel pins and bushings for the railroads of the United States and Canada, Ex-Cell-O made a noteworthy contribution to American transportation.

In 1930, the introduction of their diamond boring machine formally marked the company's entrance into the machine tool field and today their Machine Tool Division is one of the nation's leading manufacturers of highly accurate machine tools. Many models of machines for single-point boring by tools tipped with either diamond or tungsten carbide have been developed since 1930. In the field of thread grinding Ex-Cell-O started in the early thirties the development of a grinder that would produce threaded work to the same high accuracy as attained in the machining of non-threaded ground parts.

The original Ex-Cell-O thread grinding machine, introduced in 1935, along with eight other styles that followed, has contributed much to the progress that has been made by industry in the economical production and widespread use of precision threaded parts.

Among the other well known products of the Ex-Cell-O Machine Tool Division are internal lapping machines, center lapping machines, carbide tool grinders and round broach sharpeners.

In addition to these standard machines the company has had a wealth of experience in designing and producing precision machines that perform multiple operations—special purpose machines—a field entered in 1930.

The Aircraft Parts and Diesel Divisions are large scale Ex-Cell-O operations the output of which have contributed greatly to the company's highly successful and all-out war effort.

# TEMPERATURE CONTROL OF DIE CASTING

**by M. D. Pugh**

The highest quality of die castings either as to strength, density or finish is dependent on three important factors. These are:

(1) temperature of the metal,
(2) temperature of the mold and
(3) time cycle of the casting operation.

To maintain the temperature of the metal within close limits is not enough. The temperature of the mold is of almost equal importance and must be as carefully maintained. Likewise if the cycle of casting or time interval is not uniform, even though the metal temperature remains constant, the mold temperature will be affected and the quality of casting will vary.

Die casting is done either by hand pouring into sectional molds or by machine and under pressure. Among the hand poured white metal castings are casket hardware, statuary and ornamental castings, lamp bases, toys and similar items where slight porosity is of no consequence.

Castings which must have the utmost strength and soundness are generally cast under pressure by die casting machines. These castings include airplane and machinery parts of various kinds where light weight and strength are needed.

There are five alloys now in common use for die casting and other white metal castings. They are:

1. Lead base alloys
2. Tin base alloys
3. Zinc base alloys
4. Aluminum alloys
5. Magnesium alloys

Each has its special use and each alloy has its own proper pouring or casting temperature for a given size and type of casting. In general these temperatures range as follows:

Lead and tin base alloys 400 to 700 degrees F.

Zinc base alloys 850 to 950 degrees F.

Aluminum alloys 1200 to 1450 degrees F.

Magnesium alloys 1100 to 1200 degrees F.

It must not be assumed that the temperature of the metal for any given type and size of casting can vary within the range shown. In fact, a difference of 15 or 20 degrees F in the metal temperature of some castings may alter the appearance and soundness of the metal and a difference of 50 degrees F may be sufficient to cause failure of the casting under test or use, thus resulting in costly rejections.

**Checking temperature of aluminum die casting alloy with an Alnor Pyro Lance in the Los Angeles plant of the Harvill Corporation. In the background are Brown dual control pyrometers connected to the same furnace.**

**Harvil operator checking die casting mold temperature with an Alnor surface pyrometer. The mold is preheated by gas before casting starts.**

The same can be said of mold temperatures. Molds when too cold will cause too rapid solidification at the surface or in areas of smallest cross section which causes weakened grain structure or porosity. When molds are too hot they will affect the appearance of the casting surface and may also affect the casting strength and density.

The mold temperature will depend on the size and shape of the casting and may run between 400 and 800 degrees F. For each kind of alloy and size of casting there is one best temperature for both metal and mold. The smaller the casting the higher can be the metal temperature and, of necessity, the higher the mold temperature to offset rapid cooling.

All modern die casting plants use temperature controllers to automatically maintain the temperature of the metal. These may be either recording controllers which make a continuous chart record of the metal temperature or indicating pyrometer controllers that merely show the temperature at all times but do not make a chart record.

In either case the controller is operated by a protected thermocouple inserted permanently and directly into the molten metal.

The volume of fuel is controlled by a fuel valve, either solenoid or motorized, operated automatically by the controller.

In some smaller plants a simple indicating pyrometer is used to show the operator the metal temperature and the regulation or adjustment of the fuel valve is made manually. This method is not as reliable as the automatic controller as it leaves too much to the human element, but it is better than nothing at all.

### Dual Metal Furnace Control

In some of the most advanced die casting plants the use of dual temperature control of the metal melting furnaces is now employed. By this method one controller is used for the metal temperature and the other controller is used to control the combustion chamber or firebox temperature of the same furnace. Both controllers are connected to the one fuel valve so that in the event of either the combustion chamber temperature or metal temperature running too high the fuel supply will be reduced or shut off. This dual control serves also to control the temperature of the metal to within closer limits because it precludes overshooting or under-shooting. Likewise each controller stands guard against possible failure of the other.

### Mold Temperatures

While nearly all plants use some method of preheating the mold, few have a means of regulating or controlling the mold temperature except by the heat of the metal being cast and by the time cycle of pouring. In some operations, too high a mold temperature is guarded against by use of cooling water piped within the mold itself.

It is seldom possible to have permanently attached thermocouples and pyrometers to give continuous mold temperature readings. These temperatures are usually checked with an extremely fine and quick reading thermocouple, which requires only the placing of its tip on the mold surface.

### Slush Mold Castings

In peace time slush molding was quite common for ornamental and statuary castings, toys, lamp bases and a variety of similar items. This method consti-

tutes pouring hollow castings without a core by allowing a metal shell to solidify against the mold surface and then pouring back into the metal pot the still fluid metal remaining inside the casting shell. It at once becomes apparent that here the time cycle of casting as well as the metal and mold temperatures are of utmost importance.

Without pyrometers to show the metal and mold temperatures, much morning and noon starting time is lost due to "cut-

**Magnesium scrap in the Harvill plant is remelted and refined before being poured into ingot molds. Alnor Pyro Lance and Brown Indicating Controller contribute toward constancy of metallurgical analysis.**

ting and trying" until the proper casting conditions are attained. Metal too cold or a mold too cold would result in too thick a shell thus causing loss of metal and increased rejections. Too hot metal or too hot a mold would slow down the casting time and reduce production. Pyrometers to control or at least to indicate metal temperatures and a surface pyrometer to show mold temperatures save many times their cost in better castings and greater production.

### Remelting and Refining of Scrap

The remelting and refining of scrap consists primarily of the melting down of scrap and pouring it into ingots, using care, meanwhile, that the analysis of the metal is retained. This means careful segregation of the scrap before melting and close temperature control in order that none of the lower melting point metals in the alloy are burned out by too high a temperature, thereby changing the composition or alloy structure. This is particularly true with alloys containing tin or zinc. Excessive temperatures cause rapid oxidation and will reduce fluidity and weaken the metal.

In these days of shortages, every casting and every man hour that can be saved contribute toward aiding the war effort. Furthermore, every cubic foot of gas, every pint of oil or every pound of coke wasted not only reduces profits but contributes to further scarcities.

## SPI Fall Conference

The Society of the Plastics Industry will hold their Fall Convention on November 13 and 14 at the Waldorf-Astoria Hotel in New York City. C. S. Shoemaker of the Dow Chemical Co. will be chairman of the Meeting Committee as he was last year. Other members of the Committee are: Bernard Schiller of Ardee Plastics Co., Inc., assistant chairman; R. D. Werner of R. D. Werner Co., Inc., treasurer; Chris Groos of Boonton Molding Company, assistant treasurer and in charge of registration; Charles S. Lawrence of American Plastics Corp. and John D. Herlands of Button Corp. of America, speaker's arrangements; Herman B. Lermer of Celluplastic Corp., publicity; Sidney Lewis of Advance Molding Corp., hotel and food; A. C. Manovill of Plastics Manufacturers, Inc., literature and program; William Scott of Allied Plastics Co., reception; C. W. Marsellus of Universal Plastics Corp., special features; Truman Handy of Celanese-Celluloid Corp., group meetings; and Charles A. Breskin of Modern Plastics, Inc., merchandising.

Group meetings have special emphasis on the program. Included are meetings of the injection molders headed by Daniel D. Whyte of Injection Molding Corp.; Machinery Manufacturers under James P. Wilson of The Watson-Stillman Co.; Button Manufacturers with A. C. Manovill of Plastics Manufacturers, Inc.; Fabricators chairmanned by Abraham Seidman of Ace Plastic Novelty Co.; Extruders will meet with Fred M. Damitz of National Varnished Products Corp.; and Compression Molders with C. A. Norris of Bakelite Corp.

# MATERIALS WEIGHT TABLES, Part V.

The tables following on pages 119, 120, 121 and 122 comprise the fifth installment of the Materials Weight Tables.

The tables were originally calculated and compiled by Geo. H. Thompson, Treasurer, The Cleveland Metal Stamping Co., and have been in practical, everyday use for many years. Their working value has, therefore, been time tried and proved.

Designed to reduce to a minimum the work of calculating the total weight of steel (based on a steel of 1 cu.in. = .2836 lb.) required for a given press run, the tables are so basic as to be readily applicable for other materials and purposes.

The use of the tables is of the utmost simplicity. For instance, given a job that is to be blanked out of strip stock 4" wide, with a "pitch" or length of stock feed per blank of 10⅛", and an assumed stock thickness of .033": in the column headed by 10⅛" we find the constant 11485.80 opposite 4". Multiplying 11485.80 by .033 gives 379 which is the weight in pounds for 1,000 pieces 4" x 10⅛" x .033".

Suppose, however, that the stock requirement was 4⅜" x 10⅛": in such a case we refer to the same column headed by 10⅛", and to the constant given for 4" we add the constant given for ⅜", or 11485.80 + 1076.79 = 12562.59. This new constant multiplied by .033 gives 415 lbs. as the weight of 1,000 pieces 4⅜" x 10⅛" x .033".

Additionally, the tables will give the weight of a single piece of stock by moving the decimal point three places to the left. For instance, to find the weight of a block of steel 9⅞" x 12" x 6": in the column headed by 9⅞" we find the constant 33606.60 opposite 12"; therefore, by moving the constant's decimal point three places to the left (making it 33.6) and multiplying by 6 we get 201.6 as the weight in pounds of a block of steel 9⅞" x 12" x 6". At this point it should be noted that the fastest use of the tables can be made by so choosing the constant that it may be multiplied by the simplest of the several factors. For instance, in the example just given we could have used the constant given for 9⅞" x 6", or 16.8 (after moving the decimal point 3 places to the left). This multiplied by 12 also gives the weight as 201.6 lbs. but is a more involved multiplication chore than in the first instance. In other words, 33.6 x 6 is a simpler multiplication than 16.8 x 12.

The tables will serve for weight calculation of any material by multiplying the weight of the stock in steel by the appropriate conversion factor. For instance, in the example given for steel 4" x 10⅛" x .033" weighing 379 lbs. per 1,000 pieces, multiplying the steel weight by 1.136 gives the stock weight requirements for the same job in sheet copper; or 379 x 1.136 = 430.5, the weight in pounds for 1,000 pieces of copper 4" x 10⅛" x .033".

Even when worked entirely "by hand" the tables are a valuable time saver. However, for those who are used to working entirely with and depending upon a slide rule, the tables still serve as a shortcut. A given constant multiplied arithmetically by the stock thickness in thousandths is appreciably faster than running through the slide rule settings for *length x width x thickness x weight*, and, at the same time, more accurate, which is most important as we deal in greater quantities. Nevertheless, the speed and convenience of manipulating only one setting of the slide rule to *constant x thickness* permits a double check for accuracy and is still a time saver.

Stock requirement calculations based on conventional tables of gauge weight per square foot do not facilitate taking into consideration the weight variable occasioned by the stock thickness tolerance. In contrast to this, compare the ease with which our tables may be employed to determine the range in weight due to thickness variations. In the case of a stock thickness of .050", plus or minus .005", by the quick multiplication of the constant by, first, .045 and second by .055 we accurately arrive at the high and low limits.

In conclusion, the combined accuracy and facility of these tables is such as to permit the calculation of stock requirements with the assurance that variables are reduced to a minimum.

## MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement) — PART V[3]

Calculated and Compiled by Geo. H. Thompson

| | 9 1/16" x | | 9 1/8" x | | 9 3/16" x | | 10" x | | 10 1/16" x | | 10 1/8" x | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1" | 2782.83 | 1" | 2800.55 | 1" | 2818.28 | 1" | 2836.00 | 1" | 2853.73 | 1" | 2871.45 |
| 2" | 5565.65 | 2" | 5601.10 | 2" | 5636.55 | 2" | 5672.00 | 2" | 5707.45 | 2" | 5742.90 |
| 3" | 8348.48 | 3" | 8401.65 | 3" | 8454.83 | 3" | 8508.00 | 3" | 8561.18 | 3" | 8614.35 |
| 4" | 11131.30 | 4" | 11202.20 | 4" | 11273.10 | 4" | 11344.00 | 4" | 11414.90 | 4" | 11485.80 |
| 5" | 13914.10 | 5" | 14002.80 | 5" | 14091.40 | 5" | 14180.00 | 5" | 14268.60 | 5" | 14357.30 |
| 6" | 16697.00 | 6" | 16803.30 | 6" | 16909.70 | 6" | 17016.00 | 6" | 17122.40 | 6" | 17228.70 |
| 7" | 19479.80 | 7" | 19603.90 | 7" | 19727.90 | 7" | 19852.00 | 7" | 199761.10 | 7" | 20100.20 |
| 8" | 22262.60 | 8" | 22404.40 | 8" | 22546.20 | 8" | 22688.00 | 8" | 22829.80 | 8" | 22971.60 |
| 9" | 25045.40 | 9" | 25205.00 | 9" | 25364.50 | 9" | 25524.00 | 9" | 25683.50 | 9" | 25843.10 |
| 10" | 27828.30 | 10" | 28005.50 | 10" | 28182.80 | 10" | 28360.00 | 10" | 28537.30 | 10" | 28714.50 |
| 11" | 30611.10 | 11" | 30806.10 | 11" | 31001.00 | 11" | 31196.00 | 11" | 31391.00 | 11" | 31586.00 |
| 12" | 33393.90 | 12" | 33606.60 | 12" | 33819.30 | 12" | 34032.00 | 12" | 34244.70 | 12" | 34457.40 |
| 1/16" | 173.93 | 1/16" | 175.04 | 1/16" | 176.15 | 1/16" | 177.25 | 1/16" | 178.36 | 1/16" | 179.47 |
| 1/8" | 347.85 | 1/8" | 350.07 | 1/8" | 352.28 | 1/8" | 354.50 | 1/8" | 356.72 | 1/8" | 358.93 |
| 3/16" | 521.78 | 3/16" | 525.10 | 3/16" | 528.43 | 3/16" | 531.75 | 3/16" | 535.07 | 3/16" | 538.40 |
| 1/4" | 695.71 | 1/4" | 700.14 | 1/4" | 704.57 | 1/4" | 709.00 | 1/4" | 713.43 | 1/4" | 717.86 |
| 5/16" | 869.63 | 5/16" | 875.17 | 5/16" | 880.71 | 5/16" | 886.25 | 5/16" | 891.79 | 5/16" | 897.33 |
| 3/8" | 1043.56 | 3/8" | 1050.21 | 3/8" | 1056.85 | 3/8" | 1063.50 | 3/8" | 1070.15 | 3/8" | 1076.79 |
| 7/16" | 1217.49 | 7/16" | 1225.24 | 7/16" | 1233.00 | 7/16" | 1240.75 | 7/16" | 1248.50 | 7/16" | 1256.26 |
| 1/2" | 1391.41 | 1/2" | 1400.28 | 1/2" | 1409.14 | 1/2" | 1418.00 | 1/2" | 1426.86 | 1/2" | 1435.73 |
| 9/16" | 1565.34 | 9/16" | 1575.31 | 9/16" | 1585.28 | 9/16" | 1595.25 | 9/16" | 1605.22 | 9/16" | 1615.19 |
| 5/8" | 1739.27 | 5/8" | 1750.34 | 5/8" | 1761.42 | 5/8" | 1772.50 | 5/8" | 1783.58 | 5/8" | 1794.66 |
| 11/16" | 1913.19 | 11/16" | 1925.38 | 11/16" | 1937.56 | 11/16" | 1949.75 | 11/16" | 1961.94 | 11/16" | 1974.12 |
| 3/4" | 2087.12 | 3/4" | 2100.41 | 3/4" | 2113.71 | 3/4" | 2127.00 | 3/4" | 2140.29 | 3/4" | 2153.59 |
| 13/16" | 2261.05 | 13/16" | 2275.45 | 13/16" | 2289.85 | 13/16" | 2304.25 | 13/16" | 2318.65 | 13/16" | 2333.05 |
| 7/8" | 2434.97 | 7/8" | 2450.48 | 7/8" | 2465.99 | 7/8" | 2481.50 | 7/8" | 2497.01 | 7/8" | 2512.52 |
| 15/16" | 2608.90 | 15/16" | 2625.52 | 15/16" | 2642.13 | 15/16" | 2658.75 | 15/16" | 2675.37 | 15/16" | 2691.98 |

[1]Based on a steel of 1 cu. in. = .2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

[3]Part I, Tool & Die Journal, May 1944
Part II, Tool & Die Journal June 1944
Part III, Tool & Die Journal, July 1944
Part IV, Tool & Die Journal, August 1944

# MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

| | 10 3/16" x | | 10 1/4" x | | 10 5/16" x | | 10 3/8" x | | 10 7/16" x | | 10 1/2" x |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1" | 2889.18 | 1" | 2906.90 | 1" | 2924.63 | 1" | 2942.35 | 1" | 2960.08 | 1" | 2977.80 |
| 2" | 5778.35 | 2" | 5813.80 | 2" | 5849.25 | 2" | 5884.70 | 2" | 5920.15 | 2" | 5955.60 |
| 3" | 8667.53 | 3" | 8720.70 | 3" | 8773.88 | 3" | 8827.05 | 3" | 8880.23 | 3" | 8933.40 |
| 4" | 11556.70 | 4" | 11627.60 | 4" | 11698.50 | 4" | 11769.40 | 4" | 11840.30 | 4" | 11911.20 |
| 5" | 14445.90 | 5" | 14534.50 | 5" | 14623.10 | 5" | 14711.80 | 5" | 14800.40 | 5" | 14889.00 |
| 6" | 17335.10 | 6" | 17441.40 | 6" | 17547.80 | 6" | 17654.10 | 6" | 17760.50 | 6" | 17866.80 |
| 7" | 20224.20 | 7" | 20348.30 | 7" | 20472.40 | 7" | 20596.50 | 7" | 20720.50 | 7" | 20844.60 |
| 8" | 23113.40 | 8" | 23255.20 | 8" | 23397.00 | 8" | 23538.80 | 8" | 23680.60 | 8" | 23822.40 |
| 9" | 26002.60 | 9" | 26162.10 | 9" | 26321.60 | 9" | 26481.20 | 9" | 26640.70 | 9" | 26800.20 |
| 10" | 28891.80 | 10" | 29069.00 | 10" | 29246.30 | 10" | 29423.50 | 10" | 29600.80 | 10" | 29778.00 |
| 11" | 31780.90 | 11" | 31975.90 | 11" | 32170.90 | 11" | 32365.90 | 11" | 32560.80 | 11" | 32755.80 |
| 12" | 34670.10 | 12" | 34882.80 | 12" | 35095.50 | 12" | 35308.20 | 12" | 35520.90 | 12" | 35733.60 |
| 1/16" | 180.57 | 1/16" | 181.68 | 1/16" | 182.79 | 1/16" | 183.90 | 1/16" | 185.01 | 1/16" | 186.11 |
| 1/8" | 361.15 | 1/8" | 363.36 | 1/8" | 365.58 | 1/8" | 367.79 | 1/8" | 370.01 | 1/8" | 372.23 |
| 3/16" | 541.72 | 3/16" | 545.04 | 3/16" | 548.37 | 3/16" | 551.69 | 3/16" | 555.02 | 3/16" | 558.34 |
| 1/4" | 722.29 | 1/4" | 726.73 | 1/4" | 731.16 | 1/4" | 735.59 | 1/4" | 740.02 | 1/4" | 744.45 |
| 5/16" | 902.87 | 5/16" | 908.41 | 5/16" | 913.95 | 5/16" | 919.48 | 5/16" | 925.02 | 5/16" | 930.56 |
| 3/8" | 1083.44 | 3/8" | 1090.09 | 3/8" | 1096.73 | 3/8" | 1103.38 | 3/8" | 1110.03 | 3/8" | 1116.68 |
| 7/16" | 1264.01 | 7/16" | 1271.77 | 7/16" | 1279.52 | 7/16" | 1287.28 | 7/16" | 1295.03 | 7/16" | 1302.79 |
| 1/2" | 1444.59 | 1/2" | 1453.45 | 1/2" | 1462.31 | 1/2" | 1471.18 | 1/2" | 1480.04 | 1/2" | 1488.90 |
| 9/16" | 1625.16 | 9/16" | 1635.13 | 9/16" | 1645.10 | 9/16" | 1655.07 | 9/16" | 1665.04 | 9/16" | 1675.01 |
| 5/8" | 1805.73 | 5/8" | 1816.81 | 5/8" | 1827.89 | 5/8" | 1838.97 | 5/8" | 1850.05 | 5/8" | 1861.13 |
| 11/16" | 1986.31 | 11/16" | 1998.49 | 11/16" | 2010.68 | 11/16" | 2022.87 | 11/16" | 2035.05 | 11/16" | 2047.24 |
| 3/4" | 2166.88 | 3/4" | 2180.18 | 3/4" | 2193.47 | 3/4" | 2206.76 | 3/4" | 2220.06 | 3/4" | 2233.35 |
| 13/16" | 2347.45 | 13/16" | 2361.86 | 13/16" | 2376.26 | 13/16" | 2390.66 | 13/16" | 2405.06 | 13/16" | 2419.46 |
| 7/8" | 2528.03 | 7/8" | 2543.54 | 7/8" | 2559.05 | 7/8" | 2574.56 | 7/8" | 2590.07 | 7/8" | 2605.58 |
| 15/16" | 2708.60 | 15/16" | 2725.22 | 15/16" | 2741.84 | 15/16" | 2758.45 | 15/16" | 2775.07 | 15/16" | 2791.69 |

[1]Based on a steel of 1 cu. in. = .2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

## MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

| | 10 5/16" x | | 10 5/8" x | | 10 11/16" x | | 10 3/4" x | | 10 13/16" x | | 10 7/8" x |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1" | 2995.53 | 1" | 3013.25 | 1" | 3030.98 | 1" | 3048.70 | 1" | 3066.43 | 1" | 3084.15 |
| 2" | 5991.05 | 2" | 6026.50 | 2" | 6061.95 | 2" | 6097.40 | 2" | 6132.85 | 2" | 6168.30 |
| 3" | 8986.58 | 3" | 9039.75 | 3" | 9092.93 | 3" | 9146.10 | 3" | 9199.28 | 3" | 9252.45 |
| 4" | 11982.10 | 4" | 12053.00 | 4" | 12123.90 | 4" | 12194.80 | 4" | 12265.70 | 4" | 12336.60 |
| 5" | 14977.60 | 5" | 15066.30 | 5" | 15154.90 | 5" | 15243.50 | 5" | 15332.10 | 5" | 15420.80 |
| 6" | 17973.20 | 6" | 18079.50 | 6" | 18185.90 | 6" | 18292.20 | 6" | 18398.60 | 6" | 18504.90 |
| 7" | 20968.70 | 7" | 21092.80 | 7" | 21216.80 | 7" | 21340.90 | 7" | 21465.00 | 7" | 21589.10 |
| 8" | 23964.20 | 8" | 24106.00 | 8" | 24247.80 | 8" | 24389.60 | 8" | 24531.40 | 8" | 24673.20 |
| 9" | 26959.70 | 9" | 27119.30 | 9" | 27278.80 | 9" | 27438.30 | 9" | 27597.80 | 9" | 27757.40 |
| 10" | 29955.30 | 10" | 30132.50 | 10" | 30309.80 | 10" | 30487.00 | 10" | 30664.30 | 10" | 30841.50 |
| 11" | 32950.80 | 11" | 33145.80 | 11" | 33340.70 | 11" | 33535.70 | 11" | 33730.70 | 11" | 33925.70 |
| 12" | 35946.30 | 12" | 36159.00 | 12" | 36371.70 | 12" | 36584.40 | 12" | 36797.10 | 12" | 37009.80 |
| 1/16" | 187.22 | 1/16" | 188.33 | 1/16" | 189.44 | 1/16" | 190.54 | 1/16" | 191.65 | 1/16" | 192.76 |
| 1/8" | 374.44 | 1/8" | 376.66 | 1/8" | 378.87 | 1/8" | 381.09 | 1/8" | 383.30 | 1/8" | 385.52 |
| 3/16" | 561.67 | 3/16" | 564.99 | 3/16" | 568.31 | 3/16" | 571.63 | 3/16" | 574.95 | 3/16" | 578.28 |
| 1/4" | 748.88 | 1/4" | 753.31 | 1/4" | 757.74 | 1/4" | 762.18 | 1/4" | 766.61 | 1/4" | 771.04 |
| 5/16" | 936.10 | 5/16" | 941.64 | 5/16" | 947.18 | 5/16" | 952.72 | 5/16" | 958.26 | 5/16" | 963.80 |
| 3/8" | 1123.32 | 3/8" | 1129.97 | 3/8" | 1136.62 | 3/8" | 1143.26 | 3/8" | 1149.91 | 3/8" | 1156.56 |
| 7/16" | 1310.54 | 7/16" | 1318.30 | 7/16" | 1326.05 | 7/16" | 1333.81 | 7/16" | 1341.56 | 7/16" | 1349.32 |
| 1/2" | 1497.76 | 1/2" | 1506.63 | 1/2" | 1515.49 | 1/2" | 1524.35 | 1/2" | 1533.21 | 1/2" | 1542.08 |
| 9/16" | 1684.98 | 9/16" | 1694.95 | 9/16" | 1704.92 | 9/16" | 1714.89 | 9/16" | 1724.86 | 9/16" | 1734.83 |
| 5/8" | 1872.20 | 5/8" | 1883.28 | 5/8" | 1894.36 | 5/8" | 1905.44 | 5/8" | 1916.52 | 5/8" | 1927.59 |
| 11/16" | 2059.42 | 11/16" | 2071.61 | 11/16" | 2083.80 | 11/16" | 2095.98 | 11/16" | 2108.17 | 11/16" | 2120.35 |
| 3/4" | 2246.64 | 3/4" | 2259.94 | 3/4" | 2273.23 | 3/4" | 2286.53 | 3/4" | 2299.82 | 3/4" | 2313.11 |
| 13/16" | 2433.86 | 13/16" | 2448.27 | 13/16" | 2462.67 | 13/16" | 2477.07 | 13/16" | 2491.47 | 13/16" | 2505.87 |
| 7/8" | 2621.08 | 7/8" | 2636.59 | 7/8" | 2652.10 | 7/8" | 2667.61 | 7/8" | 2683.12 | 7/8" | 2698.63 |
| 15/16" | 2808.30 | 15/16" | 2824.92 | 15/16" | 2841.54 | 15/16" | 2858.16 | 15/16" | 2874.77 | 15/16" | 2891.39 |

[1]Based on a steel of 1 cu. in. = .2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

# MATERIALS[1] WEIGHT[2] TABLES (T & D J Condensed Arrangement)

Calculated and Compiled by Geo. H. Thompson

| | 10 15/16" x | | 11" x | | 11 1/16" x | | 11 1/8" x | | 11 3/16" x | | 11 1/4" x | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1" | 3101.88 | 1" | 3119.60 | 1" | 3137.33 | 1" | 3155.05 | 1" | 3172.78 | 1" | 3190.50 |
| 2" | 6203.75 | 2" | 6239.20 | 2" | 6274.65 | 2" | 6310.10 | 2" | 6345.55 | 2" | 6381.00 |
| 3" | 9305.63 | 3" | 9358.80 | 3" | 9411.98 | 3" | 9465.15 | 3" | 9518.33 | 3" | 9571.50 |
| 4" | 12407.50 | 4" | 12478.40 | 4" | 12549.30 | 4" | 12620.20 | 4" | 12691.10 | 4" | 12762.00 |
| 5" | 15509.40 | 5" | 15598.00 | 5" | 15686.60 | 5" | 15775.30 | 5" | 15863.90 | 5" | 15952.50 |
| 6" | 18611.30 | 6" | 18717.60 | 6" | 18824.00 | 6" | 18930.30 | 6" | 19063.70 | 6" | 19143.00 |
| 7" | 21713.10 | 7" | 21837.20 | 7" | 21961.30 | 7" | 22085.40 | 7" | 22209.40 | 7" | 22333.50 |
| 8" | 24815.00 | 8" | 24956.80 | 8" | 25098.60 | 8" | 25240.40 | 8" | 25382.20 | 8" | 25524.00 |
| 9" | 27916.90 | 9" | 28076.40 | 9" | 28235.90 | 9" | 28395.50 | 9" | 28555.00 | 9" | 28714.50 |
| 10" | 31018.80 | 10" | 31196.00 | 10" | 31373.30 | 10" | 31550.50 | 10" | 31727.80 | 10" | 31905.00 |
| 11" | 34120.60 | 11" | 34315.60 | 11" | 34510.60 | 11" | 34705.60 | 11" | 34900.50 | 11" | 35095.50 |
| 12" | 37222.50 | 12" | 37435.20 | 12" | 37647.90 | 12" | 37860.60 | 12" | 38073.30 | 12" | 38286.00 |
| 1/16" | 193.87 | 1/16" | 194.98 | 1/16" | 196.09 | 1/16" | 197.20 | 1/16" | 198.30 | 1/16" | 199.41 |
| 1/8" | 387.73 | 1/8" | 389.95 | 1/8" | 392.17 | 1/8" | 394.38 | 1/8" | 396.60 | 1/8" | 398.81 |
| 3/16" | 581.60 | 3/16" | 584.93 | 3/16" | 588.25 | 3/16" | 591.57 | 3/16" | 594.90 | 3/16" | 598.22 |
| 1/4" | 775.47 | 1/4" | 779.90 | 1/4" | 784.33 | 1/4" | 788.76 | 1/4" | 793.20 | 1/4" | 797.63 |
| 5/16" | 969.34 | 5/16" | 974.88 | 5/16" | 980.42 | 5/16" | 985.96 | 5/16" | 991.50 | 5/16" | 997.04 |
| 3/8" | 1163.20 | 3/8" | 1169.85 | 3/8" | 1176.50 | 3/8" | 1183.14 | 3/8" | 1189.79 | 3/8" | 1196.44 |
| 7/16" | 1357.07 | 7/16" | 1364.83 | 7/16" | 1372.58 | 7/16" | 1380.33 | 7/16" | 1388.09 | 7/16" | 1395.84 |
| 1/2" | 1550.94 | 1/2" | 1559.80 | 1/2" | 1568.66 | 1/2" | 1577.53 | 1/2" | 1586.39 | 1/2" | 1595.25 |
| 9/16" | 1744.80 | 9/16" | 1754.78 | 9/16" | 1764.75 | 9/16" | 1774.72 | 9/16" | 1784.69 | 9/16" | 1794.66 |
| 5/8" | 1938.67 | 5/8" | 1949.75 | 5/8" | 1950.83 | 5/8" | 1971.91 | 5/8" | 1982.98 | 5/8" | 1994.06 |
| 11/16" | 2132.54 | 11/16" | 2144.73 | 11/16" | 2156.91 | 11/16" | 2169.10 | 11/16" | 2181.28 | 11/16" | 2193.47 |
| 3/4" | 2326.41 | 3/4" | 2339.70 | 3/4" | 2352.99 | 3/4" | 2366.29 | 3/4" | 2379.58 | 3/4" | 2392.88 |
| 13/16" | 2520.27 | 13/16" | 2534.68 | 13/16" | 2549.08 | 13/16" | 2563.48 | 13/16" | 2577.88 | 13/16" | 2592.28 |
| 7/8" | 2714.14 | 7/8" | 2729.65 | 7/8" | 2745.16 | 7/8" | 2760.67 | 7/8" | 2776.18 | 7/8" | 2791.69 |
| 15/16" | 2908.01 | 15/16" | 2924.63 | 15/16" | 2941.24 | 15/16" | 2957.86 | 15/16" | 2974.48 | 15/16" | 2991.09 |

[1]Based on a steel of 1 cu. in. = .2836 lb.

[2]Multiply constant by stock thickness in thousandths of an inch to get weight in pounds per thousand pieces

# INDUSTRIAL PLASTICS

**Procedures in Plastics**

## DESIGN OF MOLDED PLASTICS PARTS

### CONTOUR DESIGN - PART 1

**By Warren V. Prince**

The efficient production of a molded plastics part depends very greatly upon the proper design and construction of the mold. The success of the mold in turn depends largely upon the correct design or shape of the part to be molded. Other factors lie in the design of the mold, the skill of the mold maker, and the handling of the mold in the molding room. Of these factors, the correct design for the molded part will be discussed here in detail.

A few simple changes in design can change the cost of a mold almost ten fold, and it can cut the production time ten fold in many cases by influencing the molding cycle and finishing time. The cost of the mold is usually the most expensive part of a plastics molding job. The volume of production must be sufficient to offset the mold cost.

Hence, we see that the importance of correct part design cannot be over-emphasized.

Before starting the design of any plastics part, the proper material must be selected and approved by all concerned including the molder. The kind of material used determines the production method and the production method governs the design.

**General Procedure for Engineering**

Sound procedure begins with the preliminary steps. These in general will be as follows:

(1) Decision of proper material.

(2) Design of molded part by engineer-draftsman.

(3) Approval or changes by artist if appearance is important.

(4) Make an exact model out of a material such as cast phenolic, wood, metal, clay, etc., if the part is at all complicated or if appearance is an important item.

(5) Call a meeting of the following persons for discussion of the model and drawings: the user or customer, a plastics materials expert, the product engineer or draftsman, the mold designer, the mold maker, the molder or production man, the inspection foreman, and the head of the sales department. Usually these eight responsibilities are handled by fewer men.

(6) Before making multiple cavities always run test pieces on a single cavity first.

The most important person to consult before starting a production mold is the production man or custom molder. Never assume that a certain part can be molded

as designed and leave the problems up to the shop as to how it can be done. Consult the mold maker and molder.

Usually the shop men will try to make the mold and the molded parts exactly as shown on the drawings, whether it is practical or not.

Calling these men together into one meeting is much better than seeing each one individually. This is true because each person concerned will be present to answer any question that may arise concerning a change which may involve his particular interest. Furthermore, *many minds are better than one*, and ideas are much more fluent in group meetings, due to different angles of thought at the same moment.

Even after these final decisions, never begin making a production mold with multiple cavities unless the job is extremely simple and all men involved know exactly what they are doing. Bear in mind that plastics production is one of the most unpredictable of all production methods.

In building multiple cavity molds it is good practice to make a single cavity first for test. In such cases select a cavity as close as possible to the center of the platen area to prevent unbalanced pressures from influencing the results. Sometimes a dummy cavity or false cavity is necessary to balance the pressures and give more accurate results.

Even with a single cavity for the first test run, the chances are ten to one that changes will be necessary before the job is satisfactory. The changes can then be incorporated in the remainder of the cavities. Ten-to-one odds may seem exaggerated, but experienced mold designers know that such improvements can nearly always be made.

### A Word About Molds

Essentially, simple plastics molds are made of two pieces of blocks of steel that fit together face to face with the cavity where the molded part is shaped hollowed-out between them. When the mold is opened, the part is removed.

In compression molding the molding material is placed in the open mold cavity and the mold is closed upon the material. The material softens from heat and the pressure causes it to fill out the cavity. The mold is held closed while the material hardens.

In injection molding the mold is closed while the cavity is empty and heat-softened material from the heating cylinder is injected under pressure by means of a ram into the closed cavity. The pressure forces the material through a nozzle and a sprue hole in the mold. The mold is held closed under pressure while the material hardens.

Transfer molding is the injection principle applied to a compression mold. The molded part is designed in a manner similar to that for an injection mold. The molding process and the mold are different, however, from compression molding, but the cavity and the manner in which the cavity is filled is identical with injection. This knowledge will be of particular interest when we discuss core pins and inserts.

In either compression or injection molding the molded piece is removed from the cavity in much the same manner. The chief difference is that a compression molded piece will leave flash or excess material at the parting line. This is due to the fact that the mold closes on the material and comes to a stop on the overflow. Injection molded pieces have no flash because the mold is closed and

Poor Good Poor Poor

**Fig. 1—Cores cannot be removed from internal undercuts. Small undercuts can be machined after molding if necessary but are costly and sometimes affect physical properties by allowing moisture absorption and slight warpage.**

held firmly before the material is injected into the cavity, and the excess material is in the sprue instead of at the parting line. Occasionally when excessive pressures are employed flashing does occur in injection molding. In such cases

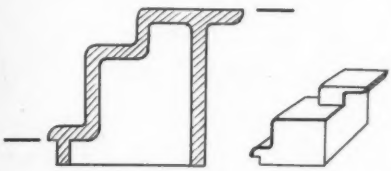


**Fig. 2—Parting lines are often on irregular levels at the outermost part of the molded piece.**

the high pressures actually distort the die and even the machine itself, thus forcing the mold apart just enough to allow some material to escape between the die halves. This is called "flashing". Flashing is very common with "jet" molding. There are several other causes of flashing, but these will be discussed later.

No matter how well the two mold surfaces fit together at the cavity, a parting line can always be detected around the molded piece. The designer will usually seek to place a parting line at the least conspicuous place. This is less true of industrial applications where there might be little or no objection to a parting line.

Ejector pins, sometimes called knockout pins, are used to remove the molded part from the cavity because nearly all molded parts tend to stick in the cavity after molding. Ejector pins are usually operated automatically when the mold is opened. The end of the ejector pins come through the mold to the cavity surface and are flush with this surface to minimize the pin marks on the surface of the finished piece after molding.

Due to the fact that ejector pins are movable parts of the die, they cannot be expected to maintain a sharp square edge at the end of the pin. The same breakdown occurs at the edge of the ejector pin hole. Thus, if the ejector pins are round on the ends, which is the usual case, they will leave a ring showing on the surface of the molded piece where the material fills out the broken down edges. Ejector pin marks cannot be avoided; therefore, make allowance for them on the finished piece. Position the part in the mold so that the ejector pin marks will come in the least conspicuous place. They can be finished or buffed off each molded part to some extent but this is generally not satisfactory. Sometimes a design or trade mark can be put on the end of the pins to make it appear as though the ejector pin marks were intended to be there.

### The First Consideration

The first step in designing any molded part is to determine how to get the part out of the cavity due to its shape, after it is molded. Do not attempt to mold an internal undercut or any shape that does not permit easy removal of the core as shown in Fig. 1. External undercuts or grooves, side holes, or other odd shapes require careful planning to assure practical removal from the mold.

Locations for parting lines are shown in Fig. 2. A molded part must come

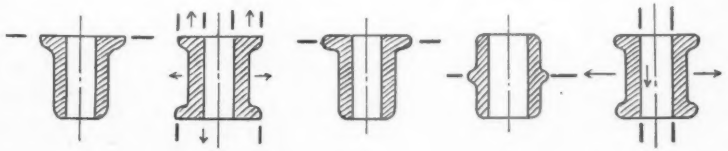



**Fig. 3—Correct and incorrect locations for parting lines are illustrated. In "a" and "b" the parting line is at a sharp edge, making flash removal easy. A split-cavity is used in "b". In "c" and "d" parting lines are incorrectly or poorly located across a radius. The part in "e" is molded on the side with parting lines at the core and on the centerline of the part.**

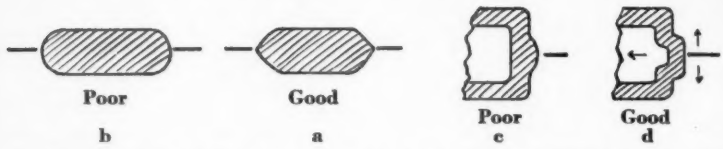



**Fig. 4—The contour of molded parts should be designed to facilitate finishing. A molded part with contour of "a" needs little or no finishing. Molded parts "b" and "c" would require careful finishing to remove flash lines. Molded part "d" would be easy to finish by the use of a flat surface sander and a buffer.**

out of the mold in the easiest possible manner, otherwise a complicated mold will be necessary, such as a split cavity mold, and production time and costs wil run up.

A small undercut on a relatively thin section is sometimes possible if it can be radiused sufficiently. Such a part can be removed by "bumping" or "stripping" the piece off the core or out of the cavity by forcing it off in the process of opening the mold while the piece is still comparatively soft. Most plastics materials are somewhat soft at the end of the molding cycle and are elastic to a limited degree. The limit of this property is taken advantage of in the example of molded bottle caps which are "bumped" off the threaded core instead of being unscrewed. In this case the threads are rounded threads and damage is not done by stripping. Accuracy, however, is sacrificed to a certain extent. Standard "V" threads cannot be bumped without destroying the thread, due to the sharp corners.

### Parting Lines

Parting lines must always be located at the outermost part of a molded piece in order to get the piece out of the cavity. If the parting line is not at the outermost part of the piece, a split-cavity or sectional mold must be used. This outermost part is arrived at by looking down at the piece parallel to its direction of removal from the cavity. Parting lines are not always on the same level but are sometimes on irregular levels around the piece as in Fig. 2.

Finishing of the molded piece from the standpoint of flash removal can often be eliminated and production costs cut, if parting lines can be located at squared edges on the piece. This is because flash can be broken off a sharp edge without detecting that it was there. Examples of this are shown in Figs. 3-a, 3-b, and 4-a. However, if they must come across a radius as in Figs. 3-c, 3-d, 4-b, or 4-c, they require the maximum of care in finishing. On a curved surface it is easy to make the mistake of sanding or filing a little too much off which would leave flat spots easily visible on the radius. Yet, if every bit of flash is not removed, the smallest portion will show up conspicuously. Filing or sanding of too much material on Fig. 4-d is not serious because it is already flat and can be buffed afterwards to regain its polish.

The most flash thickness occurs in straight compression molding with the exception of the split-cavity mold. If the two halves of a split-cavity mold, for either compression or injection, are designed with a taper so that the molding forces wedge the two halves together, flashing cannot occur at the parting line between split-cavity sections.

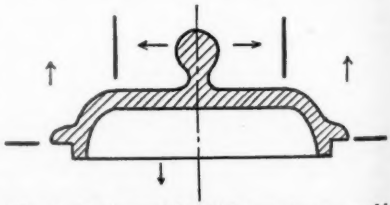


**Fig. 5—This molded lid requires a mold with a split-cavity mold section at the knob. Parting lines are shown. Split cavity designs should be avoided wherever possible because of the extra handling and because more parting lines are produced.**

## Draft

All plastics tend to stick in the mold cavity at times and some tend to stick at all times. It becomes extremely difficult to force such molded pieces out through straight untapered walls since they will bind all the way during removal and usually are deformed in the attempt. Scoring occurs in such cases.

Sticking, binding or freezing is due in part to mold shrinkage. All plastics shrink upon cooling and those that polymerize also shrink to a slight extent due to polymerization. A piece will usually stick more tightly to a core on which it is molded than it will between the cavity walls if the core is comparatively large in size and of the same surface and taper as the cavity. This is because the material shrinks upon the core but tends to shrink away from the cavity walls.

Due to this tendency toward sticking in the mold, it is necessary to put a slight draft or taper on all walls parallel to the direction in which the molded piece is to be removed. Thus, we see that draft is *taper* for easy removal of a molded part. For example, if the draft is specified on a drawing as 1°, it means 1° off centerline, or a total of 2° included between both sides. This point is often confusing to beginners. "Taper", however, is usually referred to as the included angle rather than the angle on the side.

The ideal draft angle for most materials is 3° on each side. By this is meant that 3° is the angle at which there is practically no drag on the side walls during removal of the molded piece from the cavity. Any increase in angle above 3° does not improve the situation appreciably. If the mold surface is not well polished, the draft angle should be greater or up to 5°.

On the other hand, as the draft becomes less than 3°, sticking increases gradually as the angle is reduced. The minimum draft that is practical to use is about .005 of an inch per inch of length, or slightly under ½°. Difficulty in molded piece removal is to be expected at ½° draft and ejector pins should be large enough or located in a sufficient number of places to prevent the pins from pushing up into the material or distorting the piece during removal.

There is one condition under which zero draft can be satisfactorily allowed on a cored hole. That condition is that a highly polished core be withdrawn from the piece before the mold is opened so that the entire cavity will support the piece during withdrawal, thus preventing distortion. Nevertheless, such a core will be difficult to pull and should be done before too much shrinking occurs. Bear in mind that such a core must be highly polished to prevent scoring.

Straight walls are sometimes molded on plastics parts, sometimes by necessity, but usually through oversight or ignorance. In such cases it will be noticed that slight distortion cannot be prevented and scoring of the molded surfaces having no draft is usually prominent. Consequently, the knockout pins are usually pushed up into the material of the molded piece, leaving holes as knockout pin marks. Here, too, a high polish will improve the situation.

The amount of draft to be used depends largely upon the condition of the mold surfaces and the type of molding

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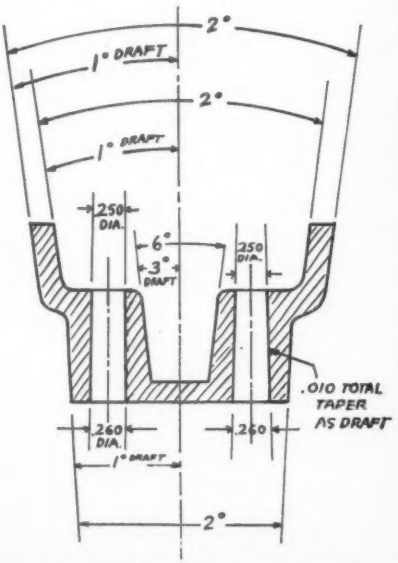



**Fig. 6—Specifications for draft showing side walls and holes.**

# PLASTIC TOOLING

## Technique and Application Considerations in Plastic Tooling Operations

**Harold Clark**
Plastic Tool Development
CURTISS-WRIGHT CORPORATION
Buffalo, New York

It has been said by reliable research groups that World War II has given such impetus to direct research that new plastic developments which would have normally required approximately fifty years, have been compressed into three years. Plastic Tooling is one of these war-born developments which has been carried through to many practical industrial applications with surprising success.

Plastic materials are divided into two main groups:

1. THERMOPLASTICS. This material becomes soft and pliable under the application of heat. It can also be reclaimed.

2. THERMOSETTING PLASTICS. This material requires heat to promote the setting. Once set, it is not greatly affected by temperature changes. It is non-reclaimable.

Casting is the least expensive method of bringing a plastic to a desired shape. This is especially true of plastic tooling where, as a usual thing, only one or a few identical tools are involved. This is the reason that thermosetting or liquid casting resins have played such an important part in the Curtiss-Wright Plastic Tooling program.

In endeavoring to outline definite procedures, every effort is being made to avoid discussing it on a technical basis in order to insure its being clearly understood by everyone. At present, there is much that is still to be learned even by those who are working in plastic tooling. The information which follows is that which has been obtained from practical experience and from laboratory tests to date. With the rapid progress being made, it is possible that this information may be obsolete by the time it is published but it is being presented as the facts known as this is written.

The liquid thermosetting casting resins are a phenol formaldehyde compound and appear to hold greater possibilities in plastic tooling than other types of plastic. This conclusion has been reached because of the economy, speed of production (casting as against other methods) and also because of the greater physical properties obtainable.

No two phenol formaldehyde resins are the same. Experience seems to indicate that this difference may be caused by the origin of the elements as well as the difference in manufacturing methods. Because of this, the technique of handling or processing could not possibly be the same and each type or make of resin requires altered procedure in handling to obtain the best possible results.

Liquid thermosetting casting resins are divided into two groups:

1. "Accelerated". This group depends on the addition of an accelerator to promote the polymerization or setting of the resin. Its addition "speeds up" the action and produces a finished casting more quickly.

2. "Non-accelerated". This group depends wholly on regulated oven temperatures to complete polymerization in a slower, more normal manner.

The second, or non-accelerated type was selected at Curtiss-Wright after much investigation and experience in actual industrial application. These tests indicated that a more stable and stronger material was obtained which was not affected by aging in the manner of the

**A splice section skin is stretched over a cored plastic form. Two parts are stretched in one piece and scribed before the part is released. The template is shown being lowered into position.**

accelerated types. Indications also point toward a more inert end material which means greater dimensional stability. These factors of physical strength in excess of minimum requirements and dimensional stability are important considerations in tooling and both requirements are found in the non-accelerated resins.

Phenol formaldehyde is a complex chemical compound, not as simple as usually supposed and any alteration in treatment affects the finished plastic in some manner. It has been shown that one set of procedures may produce in a resin certain physical properties while a slight change in handling may completely alter the results. Some resins are more sensitive to handling than others but regardless of the resin, it is apparent that the technique of handling or processing is a first consideration and a major factor affecting the quality of the finished casting.

Another factor which affects the handling is the type of casting produced. Thin-section small castings require different technique from large thick-section bulk pours. This is due to the heat conductivity of the mold and mass, and applies to all types of resins.

In plastic materials the length of the molecular chain is indicative of its strength with a longer chain denoting a stronger material. It is, therefore, *assumed* that in accelerated types, the shorter the time in which the chain is formed, the weaker the ultimate material. By comparison, in the non-accelerated types, the resin is liquid much longer during which the molecular chains can be built. This is one *possible* explanation and substantial evidence indicates that this may be the reason for this greater strength in the non-accelerated types. However, whatever the reason may be, this greater strength, plus superior aging qualities, and excellent dimensional stability are the factors which influenced the decision in favor of the non-accelerated type of resin in the quest for the best tooling plastic.

It has been the contention of the plastic tooling group that plastic as a material, to be successfully applied to tooling, must possess physical properties consistent with the application and produce actual parts equal to or better than

parts produced by any other method. Production results obtained over the past many months indicate the choice to have been wise, since a variety of draw-die punches and stretch press forms are made of non-accelerated material as well as other applications where close tolerances must be held.

Of added importance is the fact that this material may also be heat treated, oil tempered or case hardened should the application so require, and undoubtedly, this material will find its way into locations where these additional factors can be put to work.

The question which every tool designer and builder will ask is "Can I duplicate the results which have been described?" It must be remembered that much of the ultimate success of the program resulted from a liberal amount of "trial and error" applications until definite facts were established. While definite results cannot be assured without qualification, since the "know how" factor always enters the picture, yet the following information is sufficiently broad and accurate to enable a newcomer to circumvent the majority of early failures and conflicting results which attended the Curtiss-Wright program. It should be clearly understood that the following procedures apply only to the non-accelerated type of resin which has been used for the applications described.*

The resin should be transported in the shortest possible time to the user as prolonged contact with summer temperatures is detrimental. It should be stored under refrigeration, preferably a walk-in cooler, at 40° F to 50° F until needed. At these temperatures it will keep indefinitely. Since resins are under allocation by the War Production Board, accurate check of the material used is essential. The cooler, therefore, becomes the stock room and material withdrawn can be charged to the job in question. This method will assure sufficient stock to carry on current jobs, providing it is essential war work, and will prove effective for the duration as well as good practice thereafter. To check uniformity, the resin manufacturer will supply the user with specifications on each barrel purchased.

On withdrawing resin from the cooler to do a job, it will be found to be viscous—in fact, a thick, sticky mass. In order to reduce the viscosity sufficiently to pour it into the mold, it must be heated in an oven or steam coil tank to approximately 149° F to 158° F.

It is assumed that a properly prepared mold has been provided. If it is of plaster and tolerances are critical, allowance for shrink of plaster in drying plus expansion of the plaster under the oven curing heat of 168.8° F must be made. In addition to the shrinkage of the plaster mold, allowance should also be made for plastic shrinkage of .004-inch per inch plus after-shrink. This after-shrink is governed by the heats at which the plastic is cured.

Since no casting can be better than the mold in which it is poured, careful consideration should be given to its preparation. If the casting is expected to be glass smooth, then the mold surface must be equally smooth. It is essential that the plaster pores be filled and for this purpose a number of good parting elements may be had on the market. Pigmented lacquer can also be used and full coverage is assured by using a different color for the second of the two coats, both of which should be applied with a spray gun. When dry and smooth, it should be given a thin coat of hard wax.

There is a difference in the behavior of resin when poured into a solid thick section form or into a cored form. Most forms may be cored to leave wall sections up to 4½ inches in thickness since this provides strength more than ample for normal work. Only in extreme cases would cored wall sections be thicker, thus saving resin poundage over a solid casting and making it easier to handle. Solid or cored, best results are obtained by pouring hot plastic into a hot or preheated mold.

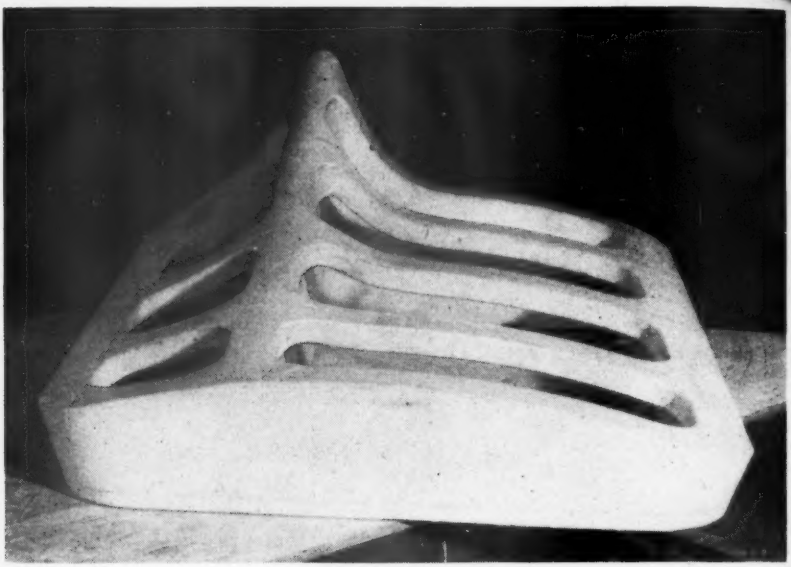
Because of the wide variety of mold sizes and types, it is difficult to set forth definite tables of temperature and time factors governing the curing cycle. However, in the case of a production schedule which has a varied group of castings to be cured, the oven temperature should be carried at a constant temperature of 168.8° F with the molds remaining in the oven for from 36 hours for small castings to as long as 120 hours for large castings.

In small thin-section castings of ap-

*Material is Catavar 101 Resin. Catalin Corp.

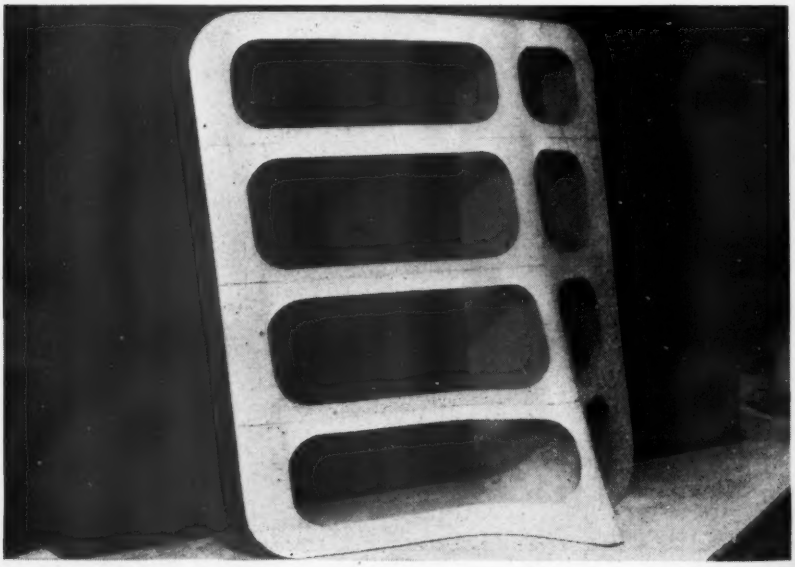
**A match angle fillet 14 feet long just removed from the stretch press. This piece replaces a former assembly of three pieces. The author is shown (left) with L. Van Valkenburgh, in charge of stretch press development.**

**A close up view of the stretching operation. Note the mounting wood base of the plastic forming tool and the method of clamping employed.**



**The plastic checking fixture for C-46 ("Commando") rear cargo hold door. This is an excellent illustration of the cored type of plastic casting.**

**Another view of the checking fixture showing the station lines which are scribed into the mold and transferred to the casting. Close tolerances are a requirement of such castings.**



proximate uniform size, with both preheated molds and pouring hot plastic, temperatures and time factors would be:

12 hours at 155° F
12 hours at 165° F
12 hours at 172° F.

When cured according to this cycle, the resulting plastic should show a Rockwell hardness of 70, "B" scale, ⅛" ball, 60 Kg. Compressive, tensile and other values will be well above that of accelerated resins.

The latest table of physical properties suppied by the manufacturer* of the resin used in the majority of the plastic tooling at Curtiss-Wright follows:

Izod impact, foot pounds per inch of notch,** .530 to .760.

Tensile strength, 9,000 to 11,500 psi.

Flexual strength, 9,500 to 14,500 psi.

Compressive strength, 20,000 to 25,000 psi.

Co-efficient of expansion, 0 to plus 25° C. $6.6 \times 10^{-4}$.***

Rockwell Hardness, ⅛" ball, 60 Kg loads H40 to H70.

Water resistance 24 hours, .4 to .6%.

These are what may be termed the common values of this resin. However, by controlling the processing technique, these values may be altered to suit some particular application.

Important factors in successfully handling this material are:

1. Uniform oven temperatures for curing.

2. Equal heat distribution throughout the resin at the time of pouring.

3. Absence of entrapped air. This can be controlled by careful stirring and pouring.

Under these conditions, all castings, large and small, will harden uniformly with the first sign of gelation appearing in the center portion of the resin mass. This is the ideal condition and occurs because of slightly higher temperatures that prevail in the center of the casting. It will be followed by the whole cast becoming opaque rather quickly, a sure sign that polymerization has proceeded uniformly without internal pressures creating stress within the casting.

If care is not taken with preparation of the resin it is of uneven temperature when poured, gelation will occur at the top of the cast first. This hardening from the top downward causes pressure to be built up in the more liquid mass below which result in internal pressures. The tendency of this pressure is to force relief through the hardened mass at the top and should it do so, pockets or holes will be created in the lower sections. When the entire cast has "set", it will be full of internal stresses which naturally result in inferior strength. This will serve to illustrate the importance of handling technique in the ultimate success of plastic castings.

It is apparent that definite technique of handling produces definite results. No amount of written matter will teach these factors to anyone, for only by practical experience are these materials handled successfully. In other words, "You'll have to get your hands dirty", for like iron ore, it's the processing that produces the wide range and variety of steel. In a measure, the same applies to liquid casting resins.

*Catalin Corp.
**See page 119, July issue.
***See page 121, July issue.

## Molded Parts Design

*(CONTINUED FROM PAGE 127)*

material. The higher the polish, the less can be the draft. ½° to 1° is permissible for polished surfaces when hot molded phenolics or ureas are used. Cold molded compounds require at least twice that amount as a minimum.

Scratches on the mold wall can destroy the advantages of draft and polish and can actually cause the piece to lodge firmly to that side of the mold containing the scratch. On the other hand, this fact can be put to advantage when a plastics part sticks to the wrong side of a mold instead of sticking to the side where the ejector pins are provided for removal. In effect a small scratch can serve as an undercut to hold the piece to the ejector pin side during opening of the mold and at the last part of the opening stroke the ejector pin knocks the part out regardless of its undercut. Such a utilization of scratches is recommended only for the experienced molder. Scratches are normally to be avoided.

To avoid scratches, always use tools of brass or some other soft metal when they may have any occasion to come in contact with the cavity surfaces.

**The next article will discuss contour design—wall thickness and contours, ribs, radii and fillets, holes, and undercuts.**

# A TIME ESTIMATE FOR AN INJECTION MOLD

## Part II

**by Gordon B. Thayer**
PLASTICS RESEARCH ENGINEER
Dow Chemical Company

### Estimate of Cavity Retainer Plate

The next piece on the mold parts list is the cavity retainer plate.

The operations which are required to produce the retainer plates and other mold plates call for a different group of time tables from that laid out for the turning operations on the cavities and cores. The new tables are presented in the order of their appearance in the list of operations for the cavity retainer plate.

### Time Values for Squaring Plates or Blocks

Figure 7 is a table of time values for squaring mold plates or blocks. The figures are based upon taking one cut on each of the six sides of a block, including the required setup time. Oil hardening tool steel or alloy mold steel are the basic materials. For cold-rolled and machine steel, 70% of the indicated values is sufficient. For high carbon, high chromium tool steel, and similar tough steels, such as may be used for hobs, 120% of the values in the tables should be used.

When not all of the sides of a block are to be machined, time should be allowed in proportion to the number of sides, with addition of .1 hour for setup for each two sides. A considerable amount of judgment must be exercised in allowing for a portion of the full

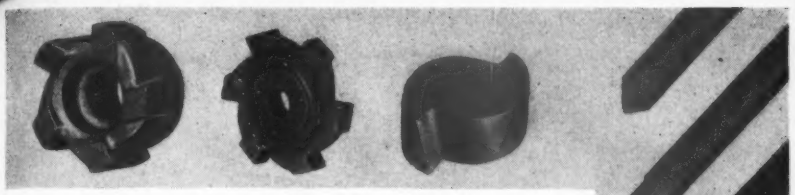
*(TO PAGE 136—PLEASE)*

**Time Values for Squaring Mold Plates or Blocks**

| THICKNESS \ WIDTH | ¼ | ½ | ¾ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 7½ | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | ¼ | ½ | ¾ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 2 | ½ | ¾ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| ½ | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

| LENGTH \ TIME IN HOURS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | .3 | .3 | .4 | .4 | .5 | .5 | .5 | .6 | .6 | .6 | .6 | .7 | .7 | .7 | .7 |
| 2 | .3 | .4 | .5 | .5 | .6 | .6 | .6 | .7 | .7 | .7 | .8 | .8 | .8 | .9 | .9 |
| 3 | .4 | .5 | .5 | .6 | .6 | .7 | .7 | .8 | .8 | .9 | .9 | 1.0 | 1.0 | 1.1 | 1.1 |
| 4 | .4 | .5 | .6 | .6 | .7 | .7 | .8 | 9 | 1.0 | 1.1 | 1.1 | 1.2 | 1.3 | 1.3 | 1.4 |
| 5 | .5 | .6 | .6 | .7 | .8 | .8 | .9 | 1.0 | 1.1 | 1.2 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 |
| 6 | .5 | .6 | .7 | .7 | .8 | .9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 |
| 7 | .5 | .6 | .7 | .8 | .9 | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 2.0 |
| 8 | .6 | .7 | .8 | .9 | 1.0 | 1.1 | 1.2 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 2.0 | |
| 9 | .6 | .7 | .8 | 1.0 | 1.1 | 1.2 | 1.3 | 1.5 | 1.6 | 1.7 | 1.8 | 2.0 | 2.1 | | |
| 10 | .6 | .7 | .9 | 1.1 | 1.2 | 1.3 | 1.4 | 1.6 | 1.7 | 1.8 | 2.0 | 2.2 | | | |
| 11 | .6 | .8 | .9 | 1.1 | 1.2 | 1.4 | 1.5 | 1.7 | 1.8 | 2.0 | 2.3 | | | | |
| 12 | .7 | .8 | 1.0 | 1.2 | 1.3 | 1.5 | 1.6 | 1.8 | 2.0 | 2.3 | | | | | |
| 13 | .7 | .8 | 1.0 | 1.3 | 1.4 | 1.6 | 1.7 | 1.9 | 2.1 | | | | | | |
| 14 | .7 | .9 | 1.1 | 1.3 | 1.5 | 1.7 | 1.8 | 2.0 | | | | | | | |
| 15 | .7 | .9 | 1.1 | 1.4 | 1.6 | 1.8 | 2.0 | | | | | | | | |

**Fig. 7**



# SPEED WORK OUTPUT

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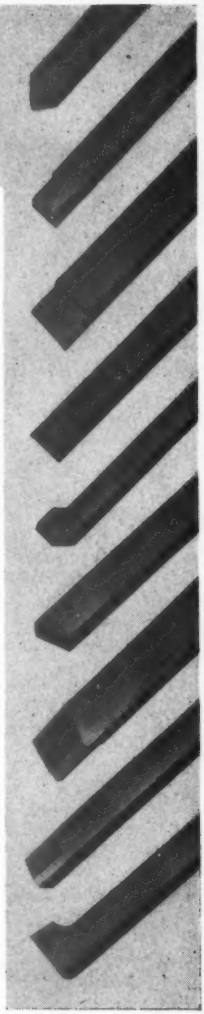

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**THE Cooper-Bessemer CORPORATION**

DEPT. J.. MOUNT VERNON. OHIO

**CAVITY RETAINER PLATE ESTIMATE**

| | | |
|---|---|---|
| Cut off stock | 1½" x 6" x 8" long (Fig. 2)<br>Large flat stock, edgewise cut<br>Set up time<br>6" depth of cut | <br><br>.1 hr.<br>.2 hr. |
| Square ends | 1½" x 6" x 8" (Fig. 7)<br>Machine two sides 1.2 hr. x 1/3 x 70%<br>Set up for two sides | <br>.3 hr.<br>.1 hr. |
| Layout | See discussion of Layout time tables | 3.1 hr. |
| Bore | Six holes 1⅛" dia. 1½" dp.<br>Four holes 1⅛" dia. 1½" dp.<br>Refer to Fig. 13 | 2.6 hr.<br>1.8 hr. |
| Ctbr. backside | Ten holes (Fig. 13) | 2.1 hr. |
| Drill water lines | Five lines, ¼" dia. x 28" total length. (Fig. 13) | 2.0 hr. |
| Pipe tap water lines | Eight holes, ½" dia. (Fig. 13) | 1.6 hr. |
| Drill and tap for mounting screws | Eight holes, ⅜" dia. (Fig. 13) | .8 hr. |
| Total Estimated Time for Cavity Retainer Plate | | 14.7 hr. |

*(CONTINUED FROM PAGE 134)*

amount of the value in the table. To machine three sides of a block requires more time per side than to machine six sides during the same machine setup.

When a block is to be ground in addition to machine squaring, time values for the grinding operation may be taken from Fig. 7 as follows:

For plain setup, use 50% of table value plus .1 hour.

For indicator setup, use 50% of table value plus .3 hour.

For grinding before and after heat treating, with indicator setup, use 100% of table value plus .6 hour.

It should be noted that the time values in these tables include "handicaps" such as waiting for a machine, time out for studying prints and similar time losses which occur in every tool room. The time values, therefore, include not only the actual elapsed time required for machining a given block of steel but also a safety factor to compensate for these time losses.

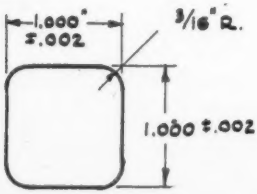



Fig. 8

**Contour Unit Layout Method**

Layout of the various mold plates is an important step which requires an appreciable amount of time. A method of estimating this time which has proved to be successful consists of assigning time units to contour lines as shown in Figs. 8, 9, 10, 11, and 12.

An example of the use of the contour units may be shown by the use of Figs. 8 and 9. Figure 8 is a rectangular layout having four straight lines and four corner radii under ¼". Only the four

**Time Values for Design Layout by Contour Unit Method**

| "C" LAYOUT TIME | |
|---|---|
| Units | Description |
| 1 | STRAIGHT LINES |
| 2 | ANGULAR LINES |
| 1 | ADDITIONAL ANGULAR LINES RUNNING PARALLEL |
| 3 | CURVED LINES WHICH CANNOT BE BORED |
| 2 | CIRCULAR CURVES ALSO CAVITY INSERT HOLES, ETC. |
| NOTE: EACH UNIT = .1 HR. | |
| WHEN MAKING TEMPLATE EACH UNIT = .6 HR. | |
| DO NOT COUNT RADII BELOW ¼" | |
| NO LAYOUT TIME FOR SQUARE OR ROUND BLOCKS. | |
| ADD 50% WHEN TOLERANCES CLOSER THAN ± .002". | |

Fig. 9

straight lines will be considered because the tables eliminate consideration of radii under ¼". Then there are four contour time units in the rectangle, each having a value of .1 hour, from Fig. 9, and the layout time for the rectangle is .4 hour, exclusive of the additional time required for specified tolerances. In this example, the specified tolerance is plus or minus .002", and the inspection time which is to be added to the layout time is 1.5 hour. This makes the total inspection time 1.9 hour and the total layout and inspection time 2.3 hour.

**Time Values for Specified Tolerances**

| INSPECTION TIME. ADD TO LAYOUT TIME. | |
|---|---|
| TOLERANCE | HRS. |
| ± .005 | .5 |
| ± .0025 | 1.0 |
| ± .0015 | 1.5 |
| ± .001 | 2.0 |

**Fig. 10**

a value of two units, one for each of the center lines.

Before proceeding with the estimate of the layout of the cavity retainer plate, a simplified example of a contour which has all of the contour characteristics listed in the table in Fig. 9 may be studied with profit. Fig. 11 is the contour and Fig. 12 shows the summations of contour units at A, B, C, D, and E. Note that the method involves merely making a few pencil lines to represent the contour lines, and counting the units as the pencil lines are made.

Beginning at A, as the pencil lines are drawn, the principal four lines of the

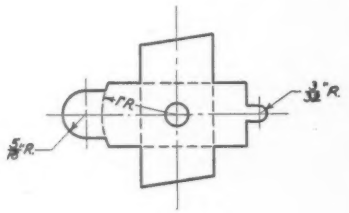



**Fig. 11**

**Contour Unit Values**

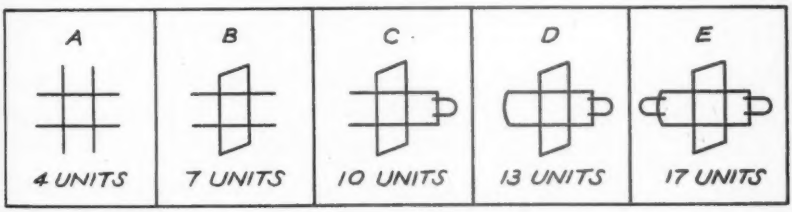



**Fig. 12**

A further explanation of Fig. 9 is as follows. Any straight line in the contour of a layout, as well as the continuation of it, either horizontal or vertical, is considered as one unit. A contour line which is at an angle to such a straight line and its continuation is considered 2 units. An angular line running parallel to another such angular line which has already been counted has the value of one unit. Curved contour lines which cannot be bored are valued at 3 units. On the other hand, a circular contour such as a cavity insert hole or an inside radius which can be drilled or bored has contour makes 4 contour units. At B, 2 units are added for the angular line at the top, and one unit for the line running parallel to it. The total is now 7 units. At C, 3 more units are added for one vertical and two horizontal lines, and no units are added for the radius because it is smaller than ¼". At D, 3 more units are added for the curved line and at E, 4 units are added, 2 for the radii, which in this case are larger than ¼", and 2 for the straight line. The total of 17 units is correct for the estimate of the layout time for the contour.

*(TO PAGE 140—PLEASE)*

# SOMETHING *New* FOR POSTWAR

## . . . TO LICK THE TOUGHEST JOB OF ALL—

## Crank-Shaft Type Deep Drilling!

**(Down to 3/16" Diameter)**

**DRILL AND FIXTURE IN OPERATION**

A special drill and fixture that provide a constant flow of coolant right at the cutting edge—right down to the deepest point—clearing away the chips at the same time.

Solves the problem of drilling holes of extremely small diameter—far beyond the limits of the smallest drill that can be made with an oil-hole.

Developed (and patented) by the makers of the famous "SUPER-KOOL" Oil-Hole Drill, which has won acclaim wherever oil-hole drills are used.

### NOTE:

At present, due to the great demand for metal cutting tools and our limited facilities, we are unable to supply engineering details. Please keep us in mind for postwar.

**Drilling in Process**

Note how the coolant is flushing the chips from the bottom of the hole. The drill has just started to break through.

**Drilling Completed**

In this photograph the drill has broken through. The solid column of coolant indicates clearly the force of the coolant during the drilling operation.

**DETROIT REAMER & TOOL COMPANY**

2830 E. 7-Mile Road Detroit 12, Michigan

(CONTINUED FROM PAGE 137)

### Layout of Cavity Retainer Plate

Now the layout time for the cavity retainer plate may be estimated by examining the face view of the mold as shown in Fig. 13,* the view facing the injection half of the mold. The contour units may be itemized as follows.

| | |
|---|---|
| Horizontal Lines | 3 units |
| Vertical Lines | 5 |
| Angular Lines | 4 |
| Hole circle for cavities | 2 |
| Water Line drill centers | 5 |
| Total layout time | 19 units |
| Inspection | |
| (Tolerance .005") | 5 units |
| (Layout time) | 7 units |
| | 31 units or 3.1 hr. |

In estimating the inspection time, only the guide pin bushing holes, and the cavity holes layouts need to be checked accurately, so the inspection time is cut accordingly, by adjusting the amount of layout time in the estimate to be equal to the time required to lay out the holes which are to be checked to the tolerances shown. The total layout and inspection time, 3.1 hour is entered in the list of operations as "layout" time.

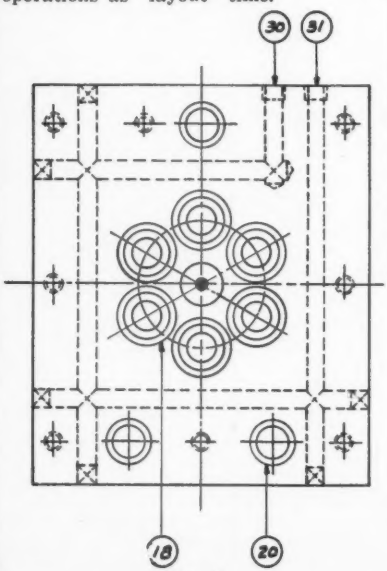



Fig. 13

*See also Fig. 1, Page 104, August issue.

### Time Values for Machining Round Holes •

Drilling, reaming, tapping, and boring in the milling machine are similar operations which are performed on mold plates. A time table for estimating these operations is presented in Fig. 14.

The values in Fig. 14 are for hole depths up to 1½". For deeper holes the following factors apply:

From 1½" to 3" deep, use 200%

From 3" to 5" deep, use 400%

For High Carbon-High Chromium Steel or "tough" alloy mold steel, add 25%

Setup time per group of holes, add .1 hour, except for Mill-Bore add .2 hour per group of holes.

The table of time values in Fig. 14 is used to estimate the remainder of the operations on the cavity retainer plate. The next part on the list of mold parts is the core retainer plate. Its detail estimate is similar to the one just completed, and it is itemized as shown on the Core Retainer Plate Estimate.

**Time Values to Drill, Ream, Tap, Mill-Bore**

| Size | Drill | Drill Ream or Ctbr. | Drill-Ream and Ctbr. | Drill and Tap | Mill-Bore |
|---|---|---|---|---|---|
| 1/8" to 3/16" | .1 | .1 | .1 | .1 | .1 |
| 25/64" to 1/2" | .1 | .1 | .2 | .2 | .2 |
| 33/64" to 3/4" | .1 | .2 | .2 | .3 | .2 |
| 49/64" to 1" | .2 | .2 | .2 | .3 | .3 |
| 1-1/64" to 2" | .3 | .2 | .3 | .4 | .4 |
| 2-1/64" to 2 1/2" | .. | .. | .. | .. | .5 |
| 2-33/42" to 3" | .. | .. | .. | .. | .7 |

Fig. 14

### Core Retainer Plate Estimates

It is to be noted, after the cavity retainer plate and the core retainer plate are individually estimated, that the estimates are almost the same in total hours. An experienced estimator may often estimate only one of the plates and allow an equal time for the other one. This is a time saving practice when an extremely accurate estimate is not required, or when it is obvious that both plates are nearly alike.

CORE RETAINER PLATE ESTIMATE

| | | |
|---|---|---|
| Cut off stock | Same as cavity retainer plate | .3 hr. |
| Square ends | Same as cavity retainer plate | .5 hr. |
| Layout | Same as cavity retainer plate except additional pin holes must be laid out.<br>6 groups of 3 ejector pin holes<br>one group of 4 return pin holes | 3.1 hr.<br>.6 hr.<br>.4 hr. |
| Bore | 6 holes 7/8" dia. 1" deep. (Fig. 13)<br>3 holes 1 1/8" dia. 1" deep | 1.9 hr.<br>1.0 hr. |
| Ctbr. back side | 9 holes. (Fig. 13) | 1.8 hr. |
| Drill water lines | Same as cavity retainer plate | 2.1 hr. |
| Pipe tap water lines | Same as cavity retainer plate | 2.0 hr. |
| Drill and tap for mounting screws | Same as cavity retainer plate | 1.6 hr. |
| Drill and ream for sprue ejector pin | One hole, 3/8" dia. 1" deep. (Fig. 13) | .2 hr. |
| Total estimated time for Core Retainer Plate | | 15.5 hr. |

**The next installment will detail estimates for Cavity Backing Plate, Core Backing Plate and Ejector Box (Note "Itemized Parts List", Page 105, August issue.)**

## Spacers and Shims of Plastics

Artus spacers, shim and feeler gage stock of a durable plastics material have been made available to industry by Industrial Products Suppliers, Dept. T, 2 Broadway, New York 4, N. Y. A feature that shopmen will appreciate is that different thicknesses are supplied in a distinguishing color.

Spacers, shim and feeler gage stock is furnished in all thicknesses in demand. The plastics material is non-hygroscopic, impervious to oil and retains the same evenness and thickness under all normal conditions. The spacers allow the assembly of gangs of cutters or slitting saws, or pairs of gears to accurate distances of 1/2,000". Artus shim and feeler gage is obtainable in sheets 5" x 20" and in special sizes to order.

The company also makes shims for both cup and cone adjusted Timken Roller Bearings. These shims are approved by Timken Roller Bearing Company for all applications where temperatures do not exceed 175° F. Artus products also include washers, gaskets and discs of the same plastics material and gaskets and washers of Neoprene synthetic rubber.

Descriptive literature and price lists are available from the company. 594-P

## Dri-Film

Dri-film, one of the first of the silicone products to be announced, is a clear liquid, the vapor from which reacts chemically to form a submicroscopic water repellent film. The most widely used application is to protect ceramic parts of service radio equipment particularly in tropical theaters. Dri-film vaporizes at a temperature below 100° C and can be applied quickly by a simple process. It is said to be not gummy and not to increase the tendency of the surfaces to accumulate dust. Previously, it was necessary to varnish and wax ceramic parts. Dri-film is stated to be six times as effective as wax.

The silicones are made by blending silicon (base element in sand) with organic chemicals. Research has been under way for several years at General Electric and at Dow Corning Co., a subsidiary of the Corning Glass Co. and Dow Chemical Co. The materials have been produced in clear liquid, solid, oil and a rubbery-like substance form. The latter form is very recently developed. The production is not large and is entirely absorbed by war applications, most of them secret. The silicones are expected to play an important postwar role in both industrial and consumer products. B53-P

# PLASTIC SANDWICHES

An interesting plastic tooling development that illustrates engineering selection in replacement of materials—a plastics sandwich for a mounting plate for the loop antenna of the PBM—3 Mariner*—is announced by The Glenn L. Martin Company, Baltimore, Maryland.

The top of the mounting plate is flat, serving as a bearing surface for the loop antenna which is located aft atop the hull. The bottom is concave to conform to the contour of the hull. When machined from phenolic fibre plate the radius of this part was milled out by a convex cutter approximately 6 inches wide and specially ground to the required radius of $25\frac{7}{16}$". Three such tools would have been necessary to provide spares in case of breakage. The use of the new material completely eliminated the need for these tools. In addition a substantial saving in weight was made.

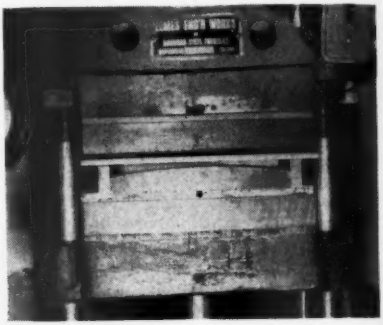
*(TO PAGE 218—PLEASE)*

*The twin engine, long-range flying boat used as a patrol bomber by the Navy. Also in use in the R.A.F.

**Two sheets of resin impregnated woodpulp forms the inner layer or core of the sandwich.**

**The resin impregnated facing paper forms the outer layers. The assembly is stapled together for handling.**

**The assembly is placed in a kirksite die and covered by a flat pressure plate.**



**The assembly and die is placed between electrically heated platens in a hydraulic press. The curing process is completed as the assembly for the next cycle is being made.**

**The molded mounting plate after removal from the press is finished by routing, drilling, and fly cutting.**

# SPRINGFIELD PRECISION LATHE

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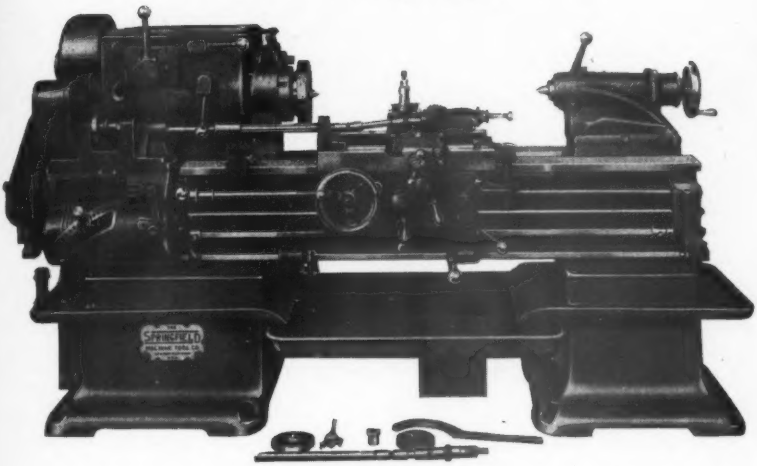

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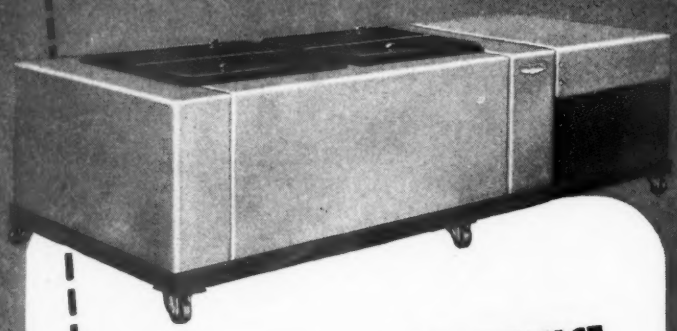
# Sub-zero



## THE NEW WAY TO REDUCE SHOP COSTS

Many metal-working plants are very profitably using sub-zero temperatures to make expansion fits instead of the old method of assembly using powerful hydraulic or arbor presses.

The sub-zero expansion fit is not only more economical—it is faster and safer. It does not induce mechanical strains within the male part. There is no danger of scoring the walls of the female member nor of misalignment of the male as it moves into position. There is no chance of bending or twisting of the male part in the operation. And the entire process is under close control.

Kold-Hold Sub-Zero Machines are serving the metal-working industry for this and other low temperature processes. Write for specific information.

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# PROGRESS ON PARADE

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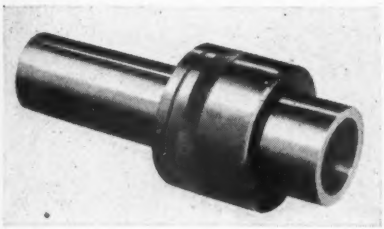
**THE NEW FLOATING TOOL HOLDER** which is manufactured by the Empire Tool Co. is designed to provide more perfect correction of misalignment, both off-center and out-of-parallel. It is made of only five components and the moving parts ride on rollers that are placed to effect a perfect self-adjustment of the float in any direction. The Empire Floating Tool Holder is used to ream holes of close tolerances to absolute size and perfect round-



ness. Because the rollers contribute also to making the members antifriction and to producing smoother running, the danger of making bell-mouthed holes is eliminated. The holder is available in two sizes—the 2½" body can be obtained with ½", ¾" or 1" holes in choice of 1", 1¼" or 1½" diameter shanks; the 3" body is made in 1", 1¼" and 1½" holes with choice of 1¼", 1½", 1¾", 2", 2¼" diameter shanks. Details are obtainable by writing EMPIRE TOOL CO., Dept. TD, 8774 Grinnell Ave., Detroit 13, Mich.
*INFORM-A-GRAM KEY No. 554-P*

**THE DALZEN "2-IN-1".** This dual purpose machine, recently announced by the Dalzen Tool & Manufacturing Co., performs both center lapping and drill press operations, thus affording considerable savings in equipment costs and in floor space. Changing the "2-in-1" over from a center grinder to a drill press or from a drill press to center grinder involves only one adjustment, i. e., lifting a pin and swinging the center grinder dresser in or out of position. This machine weighs only 165 pounds, is 67" high and its floor stand measures 15" x 21". The 10" x 10" work table is

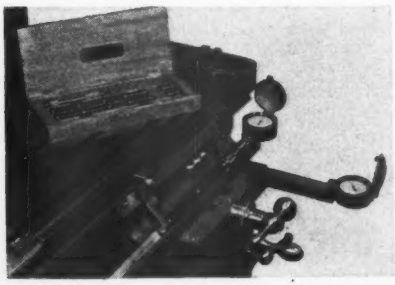
smooth and is slotted for T-bolts. Standard length between centers is 39" but other lengths are available on request. The capacity of the drill press, which will drill to the center of a 13" circle, is ½". The dresser is adjustable from 20° to 100°. The spindle rotates on two precision ball bearings, with a double bearing at the lower end to take thrust. An illustrated circular containing additional information and complete specifications of the Dalzen "2-in-1" is available by writing the DALZEN TOOL & MFG. CO., Dept. TJ, 12255 East Eight Mile Rd., Detroit 5, Mich.
*INFORM-A-GRAM KEY No. B35-P*

**GAGE-LUBE.** Protective Coatings, Inc. has developed a new product called Gage-Lube which is a life-extension treatment to be used on all types of precision surfaces, particularly

plain plug and thread gages. Gage-Lube reduces friction, thus reducing wear and making gaging easier and faster. It is rust inhibiting —maintains perfect accuracy over an extended period of time—and prevents "freezing" on extremely close tolerance gaging. It cannot "load up" when gaging soft metal components such as aluminum or cadmium

plated parts. Gage-Lube is applied either by brush or by dipping leading edge of gage into solution. It is non-injurious to the skin. PROTECTIVE COATINGS, INC., BOX 56-AI, Detroit 27, Mich., will send prices and data.
*INFORM-A-GRAM KEY No. 434-P*

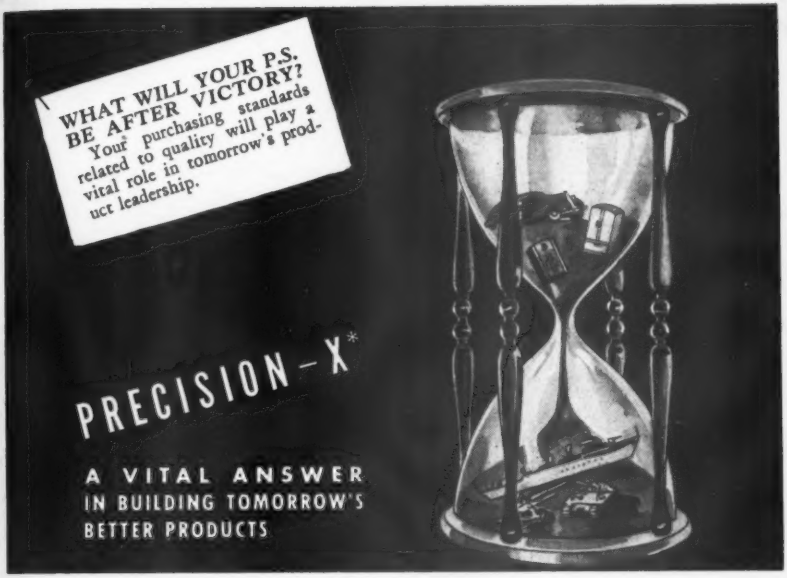
**RODS AND INDICATORS FOR INDEX MILLS.** The Index Machine & Tool Co. have designed and can now furnish measuring rods, indicators and micrometer heads to be installed on the latest model Index Mills. This equipment will allow the user to accurately locate and bore holes in an area 8" x 16". The indicator graduations, in .0001", are so widely spaced that the not too experienced operator will have no difficulty locating holes exactly where they are specified. Prices and descriptive literature may be obtained through the national distributor of Index Mills, BLANK & BUXTON MACHINERY CO., Dept. DJ, 3100 E. Michigan Ave., Jackson, Mich.
*INFORM-A-GRAM KEY No. 211-P*



**STEEL SAFETY MATS.** The Wm. F. Klemp Company's new improved steel safety mats now include a slight crimp or center bend in one side of the strong steel mesh, providing additional non-skid protection. The mats can be rolled up like a rug and are in wide use wherever men work at machines and equipment since they prevent slipping and falls,

keep feet dry, make lifting safe and reduce fatigue. They are non-absorbent and can easily be cleaned in hot water or cleaning solution. They are made in any length up to 25 feet and in any width to 6 feet. WM. F. KLEMP CO., Dept. J, 6644 S. Melvina Ave., Chicago 38, Ill.
*INFORM-A-GRAM KEY No. B14.5-P*

**NEW PORTABLE PUMP.** The "Pinch-Hitter" is a new, highly adaptable, portable, self-priming centrifugal pump which has recently been developed by BRADY PUMP CO., Dept. J, Muncie, Ind. An operator can carry the pump to the trouble spot, attach and place in operation within three minutes. The flexible hose eliminates extra piping. The "Pinch-Hitter" has a 110-volt, heavy duty, ball bearing motor and the pump's sturdy construction provides for handling abrasives or steel chips. It can also be used for cleaning sumps and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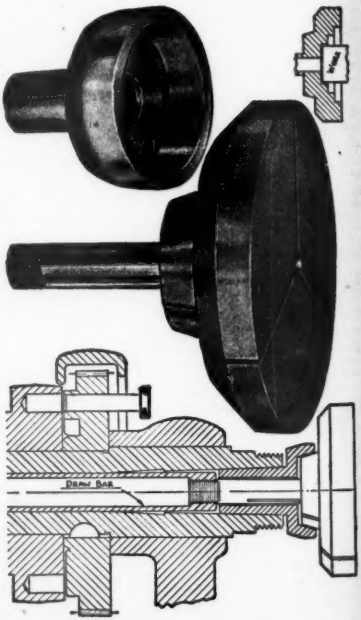
a drop per minute to full capacity by regulating discharge nozzles. Write today for additional data and prices.
*INFORM-A-GRAM KEY No. B31-P*

**SAW AND FILE ATTACHMENT FOR ELECTRIC DRILLS.** The Saw-Chief which is now being manufactured by the Chicago Precision Equipment Co., is a new attachment for converting electric drills into portable power saws and files. The device will rapidly saw various metals, castings or rod stock, wood, plastics and other materials by placing an ordinary hack saw blade in the holder with the teeth toward the operator. An automatic file is provided by simply inserting a file in the

same chuck or holder. The unit can also be propelled by attaching it to a flexible shaft. The Saw-Chief is of balanced, ball bearing construction; it is built for heavy-duty cutting and to withstand hard use. It will attach to any electric drill with a ¼" chuck and may be obtained with or without heavy-duty electric drill. The pistol-grip handle permits the operator to guide and hold the device with ease. Complete details and prices will be sent by CHICAGO PRECISION EQUIPMENT CO., Dept. D, 919 N. Michigan Ave., Chicago 11, Ill.
*INFORM-A-GRAM KEY No. B32-P*

**G-B-M COLLET STEP CHUCKS.** A recent announcement of The Gilbert-Baker-Midlam Co. is the addition of a 4½" size to their line of Step Chucks which provides chucking facility on any lathe, mill or grinding machine equipped with draw-in collets, with collet-accuracy and collet-speed. The hardened shank with tapered shoulder extends through the closing sleeve, attached to the machine spindle by a drive fit, and threads into the draw-bar. The unhardened chuck head can be bored to fit work any size from ⅝" to 4" diameter and when the draw-bar draws the tapered shoulder into the tapered recess in the closing sleeve, the bored step in the head tightens on the work. At least seven ⅛" steps can be bored in the over-size chuck head, and since each chucking step is bored on the same set-up as succeeding operations on the work held, concentricity is assured without indicating. Another type sleeve is provided to screw on the external threads of spindle for machines not having a taper spindle suitable for a drive-fit closing sleeve. THE GILBERT-BAKER-MIDLAM COMPANY, 40 North Jefferson St., Dayton 2, O.
*INFORM-A-GRAM KEY No. 841-P*



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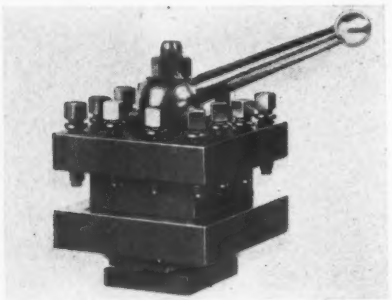
- ★ *500% Greater Expansion Range*
- ★ *Replaceable Blades May be Sharpened up to 8 Times*
- ★ *Straight Line Expansion*
- ★ *Five Types Available*
- ★ *Individual Reamers in Sizes ½″ to 3/32″*

# LEMPCO

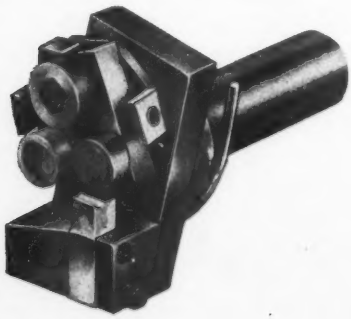
**5713 DUNHAM ROAD • BEDFORD, OHIO**

**TURRET TOOL POSTS.** The new Model HD-1 and HD-2 Turret Tool Posts, now being manufactured by the Enco Manufacturing Co., has been designed for large lathes and heavy work where extreme accuracy and rigidity in the tool post are required. Both of these models have twelve position indexing, permitting three different working positions for



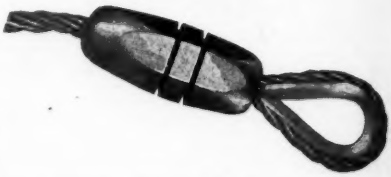
each tool. One tool may be used for more than one operation, thus saving set up and grinding time. These Heavy Duty Models are available for quick adaption to the lathe or they may be ordered made to specifications. Write to the ENCO MANUFACTURING CO., Dept. TD, Chicago, Ill., for detailed information.
*INFORM-A-GRAM KEY No. B30-P*

**ROLLER BOX TOOL.** The releasing type Roller Box Tool, which is manufactured by the WELCH TOOL ENGINEERING CO., 3011 Verdugo Rd., Los Angeles 41, Calif., has been especially designed for use on turret lathes and hand screw machines. It is positioned on the hexagon or round turret unit and combines in a single tool a cutter holder and steady-rest that travels with the cutter and supports the work. This steady—or roller—



rest holds the work against the cutter to facilitate the taking of deep cuts at heavy feeds. The box tool is of all steel construction, with no castings, and is made rigid and compact so as to pass through narrow placed tool holders on hand screw machines. The complete width of the tool is less than 2½", height 3¼" and over-all thickness of body 1½". Micrometer adjustment of the tool can be made without moving the screws which hold the tool bit, thereby minimizing set-up time. Shanks are 3" long and are easily removed so as to be used on large or small machines.
*INFORM-A-GRAM KEY No. A50-P*

**WIRE ROPE CLAMP.** The "Safe-Line" clamp, manufactured by National Production Company, is now being made in 13 sizes to fit wire ropes from $\frac{1}{16}$" to ¾". The clamp, of high tensile strength alloy steel forgings, is made in halves. The inside of each half is made to fit the rope—the large grooves pocket the large spiral strands; the small grooves pocket each small wire that makes up the strands. The large grooves hold the rope



from end-wise slippage and the small grooves prevent the rope from spiral winding out of the clamp. Every strand, every surface wire, contacts the full length inner surface of the clamp. The two halves are gripped tightly on the rope with strong alloy steel nuts. Sharp ends of wires are covered and the clamp is free from projecting nuts and bolts. NATIONAL PRODUCTION CO., 4563 St. Jean Ave., Detroit 13, Mich.
*INFORM-A-GRAM KEY No. 767-P*

**BRITE-IZE LENS CLEANER.** To encourage the maintenance of clean goggles, dial indicator faces, microscope and inspection lenses of all kinds, many companies are installing cleaning stations throughout their plants for providing Brite-Ize Lens Cleaner. The Brite-Ize Concentrate is available in hermetically sealed ampoules, which when mixed with

# HOW TO SAVE TIME

## CLAMPING and RELEASING WORK

*Here are a few Typical Cases—*

A Knu-Vise Clamp Model KK-250 is used here to hold a part steady in a fixture during drilling.

Parts to be welded for fuselage frame are held together in this fixture with four Knu-Vise KV-210 clamps.

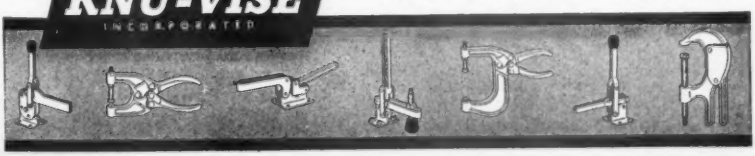
Two aircraft parts are held together with eight Knu-Vise Pliers No. KL-431 to align them for drilling and riveting operations.

Use of Knu-Vise enables you to start operations the instant the parts are placed in fixture. Flip of lever holds parts firmly in place with predetermined pressure. No time is wasted screwing down or releasing clamp.

**BUY MORE WAR BONDS**

**KNU-VISE**
INCORPORATED

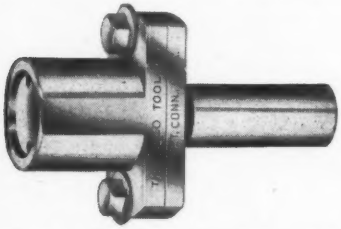
1330 PLUM STREET DETROIT 16, MICH.
4328 SAN FERNANDO RD. GLENDALE, CALIF.



distilled water make a full gallon of lens cleaner. Brite-Ize instantly removes fog, grease, grime and splatter, and leaves no halation or film. It will not injure rim plating, leather, fabric or mountings. Automatic sprayers are available which greatly facilitate lens cleaning. The Brite-Ize Dispensers

are of the pressure type, "charged" with air, either from any standard 50 lb. air line or with a small hand pump. At the touch of a lever they release the fluid in a fine mist spray. THE BRITE-IZE COMPANY, Dept. J, 1220 Pratt Blvd., Chicago 26, Ill., will send data.
*INFORM-A-GRAM KEY No. A57-P*

**THE ALCO COMBINATION ROLLER AND SUPPORT** is a new tool for screw machines which serves a dual purpose. As a revolving stop, it prevents that marring of the work ordinarily caused by roughness, imperfections or chips which accumulate on a stationary stop. The disc in the Alco Stop revolves con-



centrically with the work. This action is quickly adjustable by the floating alignment feature of the tool. Because the revolving disc is below the outside casing, oil will not splash when the work contacts the stop. When the tool is used as a support for long work or very accurate forming which requires rigidity, an easy-to-install insert replaces the revolving disc to fit the contour of the work being produced. The insert revolves exactly concentric with the work and supports it rigidly at the free end. The Alco Revolving Support makes possible the form turning of many jobs formerly considered impractical on the screw machine. THE ALCO TOOL COMPANY, Dept. J-4, Bridgeport, Conn., will send data.
*INFORM-A-GRAM KEY No. 180-P*

**ANDERSON MODEL HP-0167-P POWER PRESS.** A recent addition to the Anderson Bros. Manufacturing Co.'s line of presses is a new model with traveling ram known as the HP-0167-P Power Press. The press is especially adaptable for straightening cam shafts. Instead of moving the anvils, centers and work, the ram is moved along on ball bearings. The base and hydraulic unit are the same as used on the Anderson Model HP-010-P. An

outstanding feature of this press is its sensitive control. A shaft can be bent and inched along a thousandth at a time. The first unit made had a capacity of 10 tons. Plans have been made, however, for a 25 ton press. ANDERSON BROS. MANUFACTURING CO., Dept. TD, 1911 Kishwaukee St., Rockford, Ill.
*INFORM-A-GRAM KEY No. 190-P*

**HAND-OPERATED COLLET VISE.** The new collet vise recently announced by the NORK PRODUCTS CO., Dept. TD, 5897 S. Main St., Los Angeles 3, Calif., is compact, light in weight and will be found extremely handy for quick set-ups in a wide variety of work. Its internal piston serves as a solid stop and automatically ejects work when the collet is released. The collet is drawn in and pushed out without sticking. Fast operation is assured by a long handle moving through a short throw. All working parts, including the collet seat, are hardened and ground and the seat is precisely at right angles to the base. A base outlet permits finished work to drop through into a pan where a stop is not required. It also adapts the vise to handle long work.
*INFORM-A-GRAM KEY No. 989-P*

## YOU ARE INVESTING in Post-War Equipment

**Each Hovis Universal Master Washer Die is made on an all-steel precision standard die set which comes complete with stock gauges and stops. Five interchangeable parts are required for each size washer whether for WAR PRODUCTION OR FOR CIVILIAN PURPOSES.**

**THE MASTER DIES THEMSELVES DO NOT BECOME OBSOLETE. This naturally means a tremendous advantage by saving the cost of complete new dies. It eliminates process engineering, tool designing, tool making and tool tryout.**

***WRITE FOR OUR ILLUSTRATED CIRCULAR explaining in detail the simplicity of this method.***

**Made in 5 sizes:**

**¾"—1½"—2½"—4"—6".**

**HOVIS SCREWLOCK COMPANY**

**8100 E. NINE MILE ROAD** — **Suburb of Detroit Phone: Centerline 1575** — **VAN DYKE, MICHIGAN**

# LATROBE

## *Molybdenum* HIGH SPEED STEELS *for* CUTTING TOOLS

*Our service department will gladly help you on problems of heat treatment, selection or application.*

**DOUBLE-SIX**

| C | Cr | W | Mo | V |
|---|---|---|---|---|
| .84 | 4.15 | 6.23 | 5.10 | 1.85 |

**TATMO**

| C | Cr | W | Mo | V |
|---|---|---|---|---|
| .79 | 3.96 | 1.65 | 8.30 | 1.15 |

**T. N. W.**

| C | Cr | W | Mo | V |
|---|---|---|---|---|
| .88 | 3.90 | — | 8.00 | 1.90 |

**HV-6**

| C | Cr | W | Mo | V |
|---|---|---|---|---|
| 1.15 | 4.10 | 6.15 | 6.15 | 3.10 |

Exacting metallurgical control and years of experience in the manufacture of Tool Steels make it possible for LATROBE to produce the highest quality in molybdenum high-speed steels. ● Compare the analyses of these four steels and note the range in tungsten, molybdenum and vanadium content, thus affording the user the characteristics of toughness and abrasion resistance necessary to meet the requirements of varying metal-cutting problems.

LESCO

*Latrobe* ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT ·· LATROBE ·· PENNSYLVANIA

# INDUSTRIAL DIGEST

SCIENCE • RESEARCH • METHODS • TOOLING
PRODUCTION • TRADE NEWS AND REPORTS

### Russian Officials View Cooper-Bessemer Film

An indication of the increasing trade relations between the United States and the Soviet Union was emphasized recently in Washington where members of the Soviet Purchasing Commission attended a private showing of "Continuous Performance", an industrial film sponsored by The Cooper-Bessemer Corporation, Mount Vernon, Ohio, and Grove City, Pa. The motion picture, which traces the development of the concern's engine production 111 years ago to its present place as one of the nation's leading producers of Diesel and gas engines and compressor units, was enthusiastically received by the Russian officials. Although the bulk of Cooper-Bessemer's production is allocated to the U. S. Navy, Army, Coast Guard, Maritime Commission and home industries, they have supplied a large number of Diesel-driven electric generating units for Russian rehabilitation and report that another large order for Diesel engines is now in their hands.

### Deaf Workers Wear Red Caps for Safety

Insuring the safety of employees who were totally deaf was a problem when the Louisville Ordnance Division of Westinghouse Electric and Manufacturing Company employed such workers. It was found that their inability to hear tended to increase their efficiency in one way—because it reduced the effect of some forms of distraction; the safety problem, however, had to be solved. At the Louisville Ordnance plant, workers are required to clear from under crane loads, being warned of approaching loads by the crane bell and in some instances by hookmen.

A foreman suggested that deaf employees wear bright red caps as a distinctive marking and this form of identification was adopted as a safety precaution but only after ascertaining the deaf employees had no feeling that such a procedure would mark them as being apart from the other workers. The caps chosen were of the type used by softball players, and employees with normal hearing refrained from using caps that could be confused with the safety cap. Cranemen and operators of industrial trucks have the added responsibility of safeguarding the men who wear the red caps and who cannot hear the warning signals. The cooperation of all employees has kept the deaf workers as free of hazards as other workers on similar jobs. They have been employed by the Louisville Ordnance Division plant for over a year.

### "Next Door" Neighbor Plants Team Up to Build Army's "Best Big Gun"

The story of how two York, Pa., manufacturing plants who were "next-door neighbors" teamed up to produce what is described as "the best big mobile gun in the world," is one that everyone in that city is proud to relate. Plants of the S. Morgan Smith Company and the York Corporation are next door to each other, and, when Army Ordnance wanted the 8" gun produced, the two concerns decided that by working together, they could best solve the production problems.

In peacetime, the regular business of the S. Morgan Smith Company is the manufacture of hydraulic turbines while the York Corporation makes refrigera-

tion and air conditioning equipment.

After careful study by the two manufacturing companies, a plan was developed which divided the work between the two shops with S. Morgan Smith as the prime contractor and The York Corporation as the sub-contractor.

A contract was awarded last August, providing that the York Corporation construct the four major sub-assemblies, including the cradle, the false cradle, the right trail and left trail. S. Morgan Smith took on the job of making everything else the gun required except the barrel recoil and range instruments which are handled by Army Ordnance themselves. Final assembly of the completed gun was assigned to the Smith plant because, of the two, it had the largest space available for the work.

With the plants adjoining each other, a unique feature of the assembly line procedure was made possible—permitting plotting the step by step progress of the assembly line in such a way that the work began in the Smith plant, moved over into the York plant for the next operation, then back to the prime contractor for the subsequent step and so on. This dovetailing process was repeated until the gun finally reached completion in the Smith plant. The arrangement not only involved correlating manufacturing operations, but also required the closest cooperation between the two firms with regard to purchasing and paper work.

Working out all these details is cited as an outstanding example of all-out cooperation within industry to the end that the military forces get what they need when they need it.

Production quotas for the gun were stepped up more than once since the original contract was awarded with maximum production scheduled to be reached early this fall.

Meanwhile, the people who made the 8" gun quote authoritatively from statistics recently made public about it. They tell how extremely mobile it is; that although it weighs many tons, it can be put into action within 2½ hours after it reaches the scene, and knocked down in 45 minutes; that it throws a 240-pound shell every minute and uses a 90-pound powder charge to do it; and that Major General Gladeon Barnes, one of the world's greatest experts in gun design, has said that "it'll drop a projectile right on the courthouse steps", presumably if those steps are within the 20-mile range of the gun. Disassembled the gun is carried in two pieces. Two 20-ton, four-wheeled, dual-tired tractors are used, with one carrying the mount, or carriage, and the other carrying the barrel. A 20-ton truck crane goes along to lift the gun on its carriage.

## Scientific Scrap Salvage

A scientific scrap disposal and oil reclaiming program underway in the American Can Company's Amertorp plant in Forest Park, Ill., is saving hundreds of pounds of metal, 12,000 gallons of oil and more than 5,000 gallons of solvent monthly, according to T. J. Coonce, plant manager.

Retention of the identity of the metal by segregation at the point of origin allows for maximum re-use. For example, Mr. Coonce explains, scrap with a high chrome content is valuable as such. If it were mixed promiscuously with cast iron and carbon steels, the value of the chrome would be negligible, while as chrome steel it is of value to any purchaser.

An average month's return to the Navy from the sale of ferrous and nonferrous scrap after deduction for labor costs is approximately $6,289; prices paid for the scrap ranging as high as $358 per gross ton. Taxpayers benefit from the metal conservation program in reduced costs of operation of the plant, which at present is producing torpedoes for surface craft.

Oils for cutting purposes, which have an affinity for metal and adhere to scrap in large quantities are extracted by use of the centrifuge method, approximately 25 gallons being reclaimed from every ton of scrap. This oil consists of machine lubrication oil, hot running torpedo oil and coolant oil. After being run through the reclaiming unit and being tested for proper specifications the oil is ready for re-use. Savings from oil reclamation amount to approximately

*(TO PAGE 186—PLEASE)*

# Two-Fisted "Gripping Power"

## "Airgrip" Chucks

The two-fisted action of "Airgrip" Chucks is due to their double acting, self-locking feature. The cam's wedge action on the bottom of the levers operates in *both* directions, which more than doubles the gripping power. Also, it locks the jaws mechanically when gripping either externally or internally, so that work is held tight even if the air supply is cut off completely.

This two-fisted performance permits heavier cuts and coarser feeds to the very limit of the machine's power and cutting tool endurance. "Airgrip" Chucks, while slashing maintenance costs and reducing set-up time, will increase output records by 25%.

### "AIRGRIP" REVOLVING AIR CYLINDERS

"Airgrip" double ball bearing Revolving Air Cylinders permit speeds formerly impossible. No manual adjustments are required. This cylinder will run for years with no care or attention, as wear is automatically taken up by air pressure within the cylinder.

### HI-PO SUPERCHARGED HYDRAULIC PRESSURE PUMPS

Pump develops 3000 lb. pressure. Driven by a ½ h.p. motor! *Two-Fisted Pressure Production:* consists of a low-pressure section which supercharges a high-pressure section. Builds up pressure fast, with minimum pulsation.

WRITE FOR BULLETIN, AND CONSULT ANKER-HOLTH ENGINEERS ON PNEUMATIC OR HYDRAULIC APPLICATIONS

**Anker-Holth Mfg. Co.**

2735 Connors St. Port Huron, Michigan

# PRECISION CENTERED EYE BENDING with DI-ACRO BENDERS

## A Centered EYE in 1 Operation

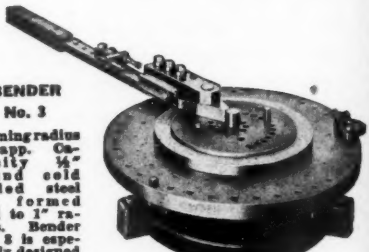
The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at a high rate of production. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

**BENDER No. 1**

Forming radius 2" app. Capacity 7/32" round cold rolled steel bar or equivalent. All DI-ACRO Benders have two-way action, right or left hand mounting and reversible forming nose.

**BENDER No. 2**

Forming radius 6" app. Capacity ½" round cold rolled steel bar, formed cold to 1" radius. DI-ACRO Benders form bus bar and other strip stock both flat and edgewise.



**BENDER No. 3**

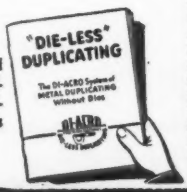
Forming radius 9" app. Capacity ½" round cold rolled steel bar, formed cold to 1" radius. Bender No. 3 is especially designed for aircraft, marine and other large radius bending.

DI-ACRO precision bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

**Send for Catalog**

**"DIE-LESS DUPLICATING"**

showing many kinds of "DIE-LESS DUPLICATING" produced with DI-ACRO Benders, Brakes and Shears.




**DI-ACRO IS PRONOUNCED DIE-ACK-RO**

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

**O'NEIL-IRWIN MFG. CO.**

315 8th Ave. S.
Minneapolis 15, Minn.

# PUBLICATION PREVIEWS

**Keep Informed!**
**CATALOGS**
**BULLETINS**
**SPECIFICATIONS**

***Use our postage-free Inform-a-Gram for your request***

**PORTABLE ELECTRIC DRILL** — An attractively illustrated brochure covering the history, development, features and specifications of the recently introduced Thor Plastic-Housed Portable Electric Drill has been published by the INDEPENDENT PNEUMATIC TOOL CO.,

Dept. T, 600 W. Jackson Blvd., Chicago 6, Ill. This booklet is a colorful and interesting exposition of the growing application in the use of plastics for many industrial purposes. Due to limited edition copies can be sent only to key executives.
*INFORM-A-GRAM KEY No. B22-P*

**PORTABLE COOLANT SYSTEMS** are presented in a catalog published by the GRAY-MILLS CO., Dept. D, 1951 Ridge Ave., Evanston, Ill. These systems include a complete range of pumps, coolant return pans and fittings for quick and simple application to most any machine tool. Varied pump capacities, in both gear and centrifugal types, are available to provide proper pressure and volume for the job. The New Model 1000, with a capacity of 2200 gph, is designed to bring cutting fluid advantages to every machine tool of the larger types.
*INFORM-A-GRAM KEY No. 555-P*

**BENCH PUNCHES & CUTTERS** are detailed and illustrated in Catalog No. 8 published by T. H. LEWTHWAITE MACHINE CO., Dept. TD, 314 E. 47th St., New York 17, N. Y. All parts are interchangeable on the Front Lever Punch. This handy bench punch has an adjustable gage and will punch up to a $\frac{7}{16}$" hole through $\frac{1}{4}$" steel or a $\frac{3}{8}$" hole through $\frac{7}{16}$" steel. Specifications and prices of the Rod Cutter, Angle Iron Cutter, Flat Bar Cutter and Cutter Parts are included.
*INFORM-A-GRAM KEY No. B37-P*

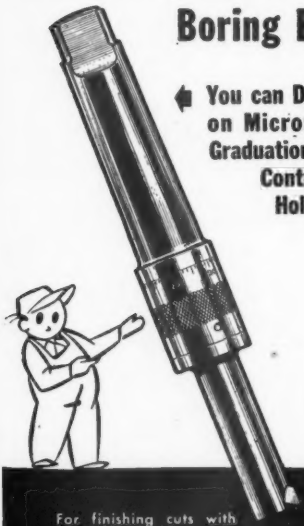
**GENERAL TOOL CATALOG**, GT-175, issued by the CARBOLOY CO., INC., Dept. T, 11109 E. 8 Mile Rd., Detroit 32, Mich., is a guide to the characteristics of Carboloy cemented carbide grades. Specifications and prices of standard and special tools are given. Carboloy boring tools can be adapted to practically all boring jobs. Also illustrated are a few typical "semi-standard" Carboloy tools which can be made to meet individual requirements.
*INFORM-A-GRAM KEY No. 82-P*

**ABRASIVE SURFACE GRINDERS** are illustrated in an 8-page bulletin issued by ABRASIVE MACHINE TOOL CO., Dept. J, E. Providence, R. I. The No. 1½ Surface Grinding Machine grinds accurately, gives a fine finish, and is recommended for the finest types of flat, form and gage grinding. The No. 3B Surface Grinder is recommended for production and tool room jobs calling for a fast, accurate, fully automatic, surface grinding machine. The No. 34 Surface Grinder is recommended for the many types of flat grinding that can be done faster and more economically by a properly designed surface grinder using a vertical spindle and ring wheel.
*INFORM-A-GRAM KEY No. 754-P*

**CINCINNATI SHAPERS** are illustrated in Catalog N-2 published by the CINCINNATI SHAPER CO., Dept. TJ, Cincinnati, Ohio. Their Rapid Traverse, Universal, Utility, High-Speed and Railroad Shapers are described. These shapers offer a built-in power rapid traverse to the table as standard equipment on all sizes. The greatest advantage of power rapid traverse is the amount of time saved by its use. It instantly moves the work up to the tool for the cut, thus reducing the time between cuts. Also, when the piece is finished, time is saved since the table can be quickly traversed to one side, so that work can be loaded and unloaded without interference by the tool.
*INFORM-A-GRAM KEY No. 630-P*

**CONTRACT FORGINGS** — rough turned or finished complete from any grade of steel for all industries are presented in a pocket-size booklet issued by AJAX STEEL & FORGE CO., Dept. D, 205 Adair St., Detroit 7, Mich. A Decimal Equivalent Chart appears on Page 34. An illustration of a 3,500-lb. open frame smooth die hammer—used for making Rings, Discs, Blocks, Bars, Hub Forgings and Special Shapes is included. SAE and NE specifications of steel and copper forgings are also given.
*INFORM-A-GRAM KEY No. 610-P*


**For Precision Boring— Universal MIKRO-LOK Boring Bars**



**You can Depend on Micrometer Graduations for Controlling Hole Size**

For finishing cuts with extreme accuracy. Extremely rigid. Easily and quickly adjusted like a micrometer to within .0005. All standard type shanks available. Singly or in sets. Write for catalog.

Army Navy "E" Flag Two Stars



Fighter Plane Given By employees

20% Employees Bond deduction

**UNIVERSAL ENGINEERING CO.**

FRANKENMUTH, MICHIGAN


**NEW PICK-O-MATIC CHANGE GEARS** for Atlas 10" lathes provide for six feeds or threads with each gear set-up as described and illustrated in Catalog L43 issued by ATLAS PRESS CO., Dept. J, 612 N. Pitcher St., Kalamazoo 13D, Mich. Also described in this catalog are accessories and attachments for 10" and 6" Atlas lathes.
*INFORM-A-GRAM KEY No. 537-P*

**BUILDERS "T" SURFACE GRINDER**—an improved surface grinding machine on which tools, dies and small machine parts can be accurately and quickly ground. Specifications and illustrations of this uniquely designed, long life, machine are presented in Bulletin 644 available from BUILDERS IRON FOUNDRY, Dept. J, 23 Codding St., Providence 1, R. I.
*INFORM-A-GRAM KEY No. 219-P*

**DIAMOND TOOL FACTS** to help in diamond tool selection are presented in Bulletin 21 published by GOLCONDA DIAMOND PRODUCTS CORP., Dept. TD, 3422 N. Knox Ave., Chicago 41, Ill. Valuable facts concerning the important types of diamonds, their uses and settings are included. Of special importance is their free Survey Service which through specific written recommendations assists you to maintain maximum operating efficiency from your tools.
*INFORM-A-GRAM KEY No. B12-P*

**DRILL BUSHINGS** are featured in Catalog J issued by UNIVERSAL ENGINEERING CO., Dept. TJ, Frankenmuth, Mich. Illustrations of locating pins and retainers are included along with tables and specifications. These bushings save valuable time on a wide variety of applications. They are straight and round and have superfinished bores, thus insuring accuracy and possessing unexcelled wearing qualities. A condensed data sheet and circular is also available. When more than three dimensions of bushings are special, it is advisable to send sketch for quotation.
*INFORM-A-GRAM KEY No. 276-P*

**GAGES AND TOOLS** manufactured by THE AMERICAN GAUGE CO., Dept. J, 125 Bayard St., Dayton 1, Ohio, are presented in Bulletin 43 issued by the company. American thread checker, amplifying gage, hole checker, bench center, radius dresser and lapping plate are described and illustrated. American Amplifying Gages are used for quickly and accurately gaging pistons, piston pins, valve stems, bushings, drills, etc., as well as in toolroom work.
*INFORM-A-GRAM KEY No. 103-P*

**C-F POSITIONERS** are illustrated in Bulletin WP-22 issued by the CULLEN-FRIESTEDT CO., Dept. J, 1316 S. Kilbourn Ave., Chicago 23.

FOR *Quicker*
SHAPING, GRINDING, POLISHING
USE SKILSAW
PORTABLE GRINDERS!

SKILSAW PORTABLE GRINDERS deliver *top load speed*, even when the going is toughest. That's why they grind down beads, studs and fins faster . . . speed up shaping, buffing and polishing. They're quality-built throughout, with many superior features such as special ball-bearing inserts to absorb vibration and spindle thrust. That's why SKILSAW PORTABLE GRINDERS run smoother, cooler, and last longer.

You'll save time, money and manpower with SKILSAW PORTABLE GRINDERS on every finishing job. Ask your distributor to show you on your own work.

**SKILSAW, INC.**
5033-43 Elston Ave., Chicago 30, Ill.
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SKILSAW PORTABLE ELECTRIC TOOLS
MAKE AMERICA'S HANDS MORE PRODUCTIVE

Ill. The table of the Positioner revolves under various controls in a full circle, thus giving the proper approach to all sides of the welding job or weldment. Rotating and tilting movements in every machine are independent in action. Hand wheels with self-locking gears, control these movements in manually operated machines. Hand machines also have the additional feature of a disengaging mechanism which permits "free" rotation, so that a balanced or circular weldment may be rotated at will without use of hand wheel.
*INFORM-A-GRAM KEY No. 670-P*

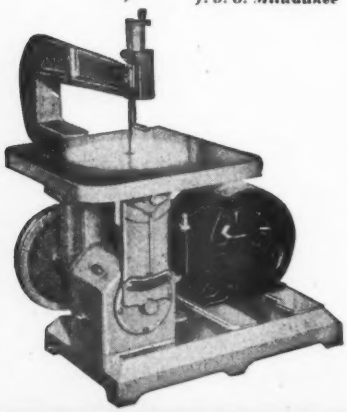

**ATLAS DIE FILER**

**This sturdy and well designed bench type machine, for rapid and accurate die filing and sawing, will eliminate many costly hand operations.**

*Complete with motor and saw attachment at*

**$125.00**

*f. o. b. Milwaukee*



**Milwaukee Chaplet and Mfg. Co.**

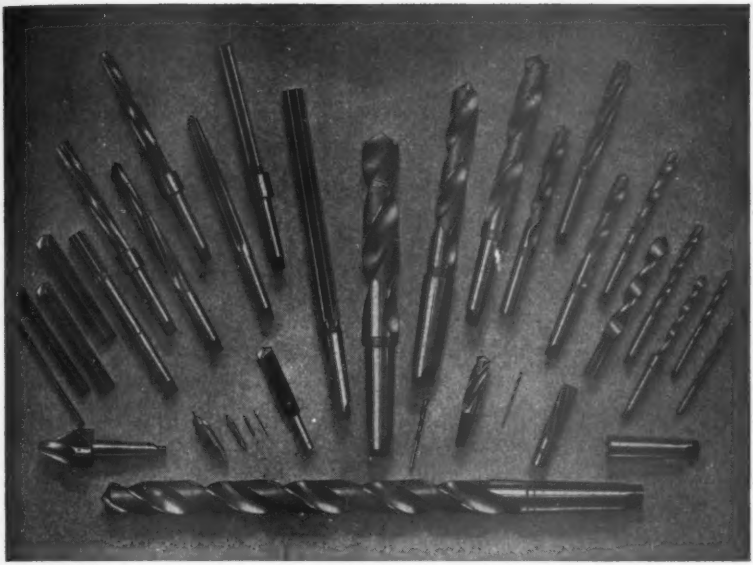
1023 S. 40th St. • MILWAUKEE, WIS.


**SPECIAL STEELS,** their properties and uses are detailed in a pocket-size handbook published by the ALLEGHENY LUDLUM STEEL CORP., Dept. TJ, Brackenridge, Pa. This handbook has been designed to assist in the selection of the proper types of tool, stainless, electrical and carbon steels in the various forms produced by Allegheny Ludlum. The analyses and properties of the steels shown in the tables and charts are those normally furnished.
*INFORM-A-GRAM KEY No. 678-P*

**HYDRAULIC ARBOR PRESSES** are featured in a 24-page illustrated booklet issued by K. R. WILSON, Dept. TD, 10 Lock St., Buffalo 2, N. Y. The sensitive finger-tip control mechanism of the KRW Speedi-Booster Hydraulic Press instantly governs ram movement for lowering, raising or stopping. A built-in air regulator permits exact duplication of pressure for each stroke. All KRW Presses are equipped with a two-speed pump and have operating levers within easy reach of the operator from the front of the press, giving him complete control without waste motion.
*INFORM-A-GRAM KEY No. 529-P*

**A NEW COMPARATOR CHART CATALOG** with a separate booklet on specifications and prices has been issued by Engineers Specialties Div., THE UNIVERSAL ENGRAVING & COLORPLATE CO., Dept. TD, 1919 E. 19th St., Cleveland 15, Ohio. The enlarged catalog shows 27 new radius charts, radius discs, protractors and projector scales. Universal charts, universal projector rules and scales for use with all types of comparators, micro and measuring projectors are described. Fillet and radius discs, that carry angles of 90° with tangent arcs in steps of .001", from .001" to .025", with undercut bevels for ease of handling are also shown. These are available in new transparent containers. Both the catalog and price list will be sent on request.
*INFORM-A-GRAM KEY No. 74-P*

**GRANITE SURFACE PLATES** are illustrated in a 4-page descriptive folder published by the HERMAN STONE CO., Dept. J, 1243 Leonhard St., Dayton 4, Ohio. These precision surface plates are practically indestructible. Heavy or pointed objects accidentally dropped on the surface will not impair its accuracy. The necessity of de-magnetizing any material before testing is eliminated on this type of surface plate. The plates will not rust, corrode or warp and they are finished to 1/10,000" over all.
*INFORM-A-GRAM KEY No. 669-P*



# *Victory* IS BUILT INTO THEM

THESE are the seasoned, disciplined shock troops, the spearheads of attack in the constant war on costs—these Celfor Reamers and highspeed Twist Drills.

Two good examples of the victorious quality built into Celfor tools are the Celfor Type B Reamer—made only by Clark; and Celfor high speed Twist Drills, forged to shape, then twisted while hot to densify the metal for greatest durability. The Celfor process preserves and increases the inherent strength and toughness of finest tool steels—produces tools that can not be excelled for strength and cutting qualities.

CELFOR

Take this simple, victorious step toward savings in man-hours, longer tool life and lower tool costs: send for the facts about Celfor Drills and Reamers.

Another PRODUCT of CLARK EQUIPMENT COMPANY

**CLARK EQUIPMENT COMPANY**
BUCHANAN, MICHIGAN

OTHER CLARK PRODUCTS—AXLES (Front and Rear) FOR TRUCKS AND BUSES • AXLE HOUSINGS TRANSMISSIONS • METAL SPOKE WHEELS • ELECTRIC STEEL CASTINGS • BLIND RIVETS GEARS AND FORGINGS • RAILWAY CAR TRUCKS • INDUSTRIAL TRUCKS AND TRACTORS

**SAWING MACHINERY CATALOG** of the TANNEWITZ WORKS, Dept. D, Grand Rapids, Mich., lists the four models of Tannewitz Di-Saw, with very complete specifications and operation data on the model 24M, the most popular model; the three high-speed band saws, identical except for size and capacity; and the variable speed (Reeves variable speed, back-gear drive or 3-step multiple V-belt drive) band saws. Special features of design and construction, examples of typical savings and complete specifications are given.
*INFORM-A-GRAM KEY No. 684-P*

**ADJUSTABLE HOLLOW MILLS** for hand and automatic screw machines, and General Purpose Mills, available in Styles A and B, are illustrated in two bulletins issued by the GENESEE MFG. CO., INC., Dept. TD, Rochester 4, N. Y. These mills can be furnished with tungsten carbide tipped blades and are adaptable for many jobs. All mills can be adjusted ⅛" and only one set of blades is needed to machine all sizes within capacity of mills.
*INFORM-A-GRAM KEY No. B40-P*

**"UNBRAKO" SCREWS** is the title of Bulletin 570 issued by the STANDARD PRESSED STEEL CO., Dept. D, Jenkintown, Pa. The Knurled Point is their latest improvement in "Unbrako" Self-Locking Set Screws. By knurling the point the "Unbrako" not only becomes so securely locked when tightened up that it will never vibrate loose by itself, but it also locks equally well regardless of how often it is adjusted. "Unbrako" Socket Head Stripper Bolts are standardized in a great variety of diameters and lengths and are immediately available from stock. All dimensions are held to close limits.
*INFORM-A-GRAM KEY No. B39-P*

**HY-PRO TAPS FOR HIGH PRODUCTION**—Illustrations, descriptions, list prices, discounts, and dimensions of Hy-Pro taps are included along with their commercial ground thread limits in a 58-page catalog issued by HY-PRO TOOL CO., Dept. T, 489 Mt. Pleasant St., New Bedford, Mass. The sizes and kinds of taps they manufacture are listed in the first section while engineering data on threading is detailed in Part II.
*INFORM-A-GRAM KEY No. B41-P*

**RADIFORM WHEEL & TOOL FORMER** is described in a 12-page illustrated catalog available from the W. F. MEYERS CO., INC., Dept. T, 1016 14th St., Bedford, Ind. The Radiform is an attachment designed to support tools to be formed on a tool and cutter or surface grinder without first forming the wheel. Complete step-by-step operating instructions for forming carbide tipped as well as high speed steel tools directly against wheel—including precision radii on spiral fluted end mills and drills are included.
*INFORM-A-GRAM KEY No. 677-P*


# MEASURING A PLUG GAGE WITH LIGHT WAVES

**using an optical flat, a toolmakers flat and a gage block**

**The formula is:**

$$D = h + \left(.000012 \times N \times \frac{W}{w}\right)$$

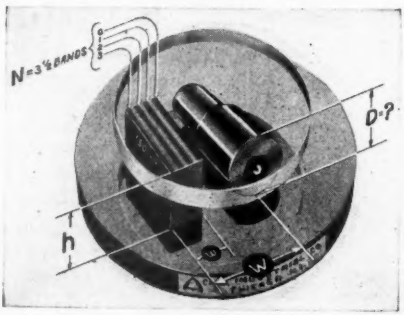
**Substitute the actual values**

$$D = .750 + \left(.000012 \times 3\tfrac{1}{2} \times \frac{1\ 7/16''}{23/64''}\right)$$

**and get the answer**

**D = .750168 inch.**

*It's just that simple!*




*Write for new, free Lightwave Measurement Booklet.*

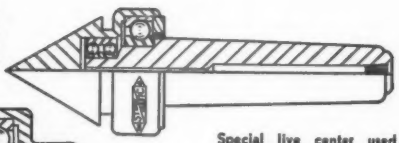
**ACME INDUSTRIAL COMPANY**

*Makers of Standardized Jig and Fixture Bushings*

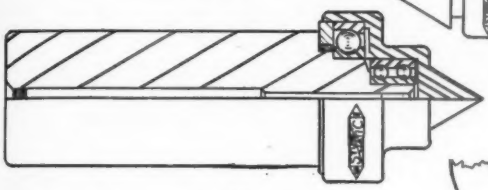
**206 N. Laflin St. Chicago 7, Ill. MONroe 4122**

# Special Live Centers

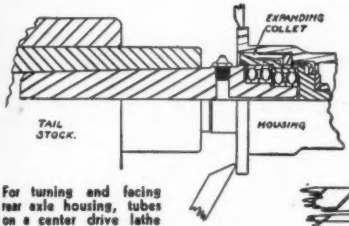
*Send us your specifications and blueprints—We will see that your job is set up with the right LIVE CENTER.*



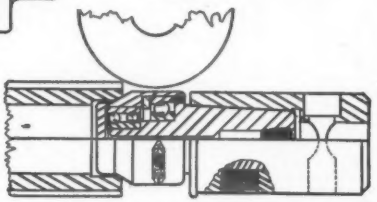
Special live center used for turning various sizes of tubing, pipe, etc.



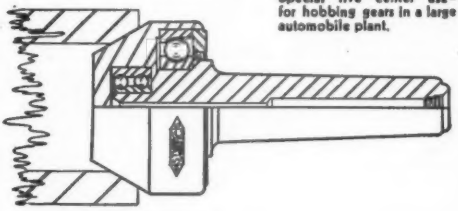
Special live center used in Warner & Swasey screw machines.




For turning and facing rear axle housing, tubes on a center drive lathe using a live center on each end, machining both ends simultaneously.



Special live center used for hobbing gears in a large automobile plant.



Special live center for turning extra large tubing.

**Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action . . . that compensates for expansion due to heat, shock and excessive thrust loads—reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requires a specialist's experience . . . standard shanks with Morse taper carried in stock. Prompt deliveries on high priorities.**

# STURDIMATIC
## TOOL COMPANY
5226 THIRD AVE. DETROIT 2, MICH.

**UNIVERSAL MASTER WASHER DIES** available in four sizes are featured in an illustrated pamphlet issued by the HOVIS SCREW-LOCK CO., Dept. TJ, 8100 E. 9 Mile Rd., Van Dyke, Mich. Each die, complete in itself and ready to use, is made on an all-steel precision standard die set and comes complete with stock gages and stops. For replacement and size change it is possible to remove five small interchangeable parts without dismantling the die.
*INFORM-A-GRAM KEY No. 135-P*

**BENCH SURFACE GRINDER**—This high-speed precision machine is specially designed for small work requiring high accuracy and fine finish. The table rests by its own weight and travels on long vee and flat ways, ground and lapped for precision, and scraped to provide ample lubrication. Further information is contained in Bulletin C issued by SANFORD MFG. CO., Dept. J, 1279-81 Springfield Ave., Irvington 11, N. J.
*INFORM-A-GRAM KEY No. 128-P*

**INDUSTRIAL LIGHTS** that "get around the corners" are described in an illustrated folder published by the VIMCO MFG. CO., INC., Dept. TD, 117 Chenango St., Buffalo 13, N. Y. Standard stock combinations that ideally answer the need for localized high-intensity lighting in the majority of cases and typical installations of "Vimcolights" on lathes, grinders, saws and other machines are shown.
*INFORM-A-GRAM KEY No. 116-P*

**CHEMICAL DEVELOPMENTS**—Vol. I, No. I, has been published by CHEMICAL DEVELOPMENTS CORP., Dept. TJ, 314 W. First St., Dayton 2, Ohio (Unit of Commonwealth Engineering Corp.), a research and development organization devoted to the practical application of chemistry and engineering to industry. A typical hydraulic press, the development of which has materially enhanced the application of powder metallurgy, is illustrated. This method of making parts from metal powders has tremendous postwar possibilities, and even today is finding widespread application in many fields.
*INFORM-A-GRAM KEY No. B13-P*

**ALTERNATING-CURRENT ARC WELDING** for fast, high-quality welding and low operating costs is presented in a colorfully illustrated 32-page booklet issued by the GENERAL ELECTRIC CO., Dept. T, Schenectady, N. Y. A discussion of the "deep-fillet" welding technique, a complete description of all their a-c arc welders for manual operation, and details on many G-E electrodes for a-c welding are included. The majority of their a-c electrodes comply with Navy Bureau of Ships specifications. Type WK, a-c welders, give all the advantages of alternating-current welding. All of them are of the transformer type with a movable coil to control welding current.
*INFORM-A-GRAM KEY No. 77-P*

**HAND-CUT ROTARY FILES** are described in an illustrated booklet issued by THE ROTARY FILE CO., Dept. D, Stratford, Conn. These files are used in a wide diversity of power-driven machines—portable or stationary—where filing, reaming, or finishing operations are required. They are employed from roughing to smooth-finishing and for surface-abrading. They work satisfactorily on ferrous and nonferrous metals.
*INFORM-A-GRAM KEY No. B9-P*

**"FACTS & FIGURES"**—An interesting 16-page booklet telling about high-speed electric hand tools and their applications is available from PRECISE PRODUCTS CO., Dept. J, 1328-30 Clark St., Racine, Wis. A concise breakdown of the outstanding features which char-

For those Headache Jobs

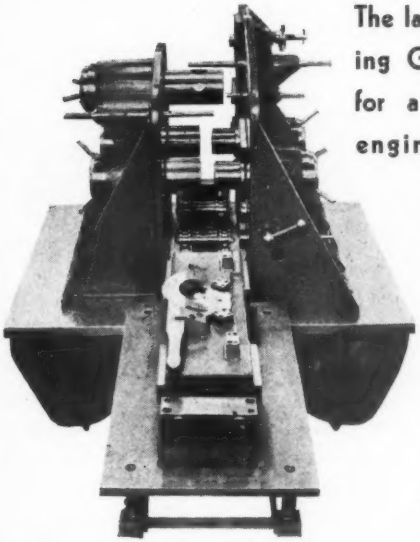
You no doubt have production tooling jobs now that seem impossible—and post-war production will bring you more. Jobs that give you a headache trying to figure out how they can be done. There is where Invincible Special Tools are needed.

Solving these production problems is our business. Just make up a sketch or send us blueprints or samples and let us design the tool that will do the work. Invincible Tool Co. has been curing these "headache jobs" for years—let us cure yours.

INVINCIBLE TOOL CO.
611 EMPIRE BUILDING
PITTSBURGH 22, PA.
Makers of Job Tested and Job Proven Tools

# POTTS
## MACHINE COMPANY

## MASTER CHECKING GAUGE



The large Master Checking Gauge, left, built for a leading airplane engine manufacturer, checks finished engine parts to a tolerance of .0002.

This is one example of our Precision Craftsmanship.

*Your Inquiries Solicited*

**POTTS MACHINE CO.**, 2501 E. Michigan Ave., JACKSON, MICHIGAN

*Builders of Tools, Dies, Jigs and Fixtures*

acterize the Precise 35 as a super high-speed electric hand tool operating at 35,000 rpm is given. An interesting comparison is made with the specifications of four of the leading tools. In addition the booklet contains an accurate description of the various accessories and mounted wheels and midget milling cutters that are available for the Precise 35.
*INFORM-A-GRAM KEY No. B21-P*

**ROBOT OIL RECLAIMER,** capable of restoring all kinds of lubricating, hydraulic, cutting and vacuum pump oils so that the reclaimed oil can be reused in the same manner and place as the new oil, is illustrated in Bulletin YM-700 issued by the YOUNGSTOWN MILLER CO., Dept. J, Sandusky, Ohio. Capacities range from 4 to 3000 gph.
*INFORM-A-GRAM KEY No. A74-P*

**STAR J-METAL CUTTING TOOLS** are presented in a new, revised pamphlet, Form 2991, published by HAYNES STELLITE CO., a Unit of Union Carbide and Carbon Corp., Dept. J, Kokomo, Ind. Sizes and prices of Star J-Metal round tools have been added to more complete data on standard square, rectangular, and tipped tools. The list of standard milling cutter blades has been extended; detailed information on tool holders and adaptors that can be made for use with Star J-Metal is given.
*INFORM-A-GRAM KEY No. 313-P*

**ROTARY PNEUMATIC TOOLS** for industry are described in a new 32-page catalog issued by the ARO EQUIPMENT CORP., Dept. TD, Bryan, Ohio. Illustrations and specifications covering the wide range of Aro models available for small tool jobs such as drilling, grinding, nut-setting, screw-driving, burring, metal-sanding and other operations are included. Speed couplers, accessories and the new line of Aro impact wrenches are also described. Distinguished by compactness and light weight in relation to power, these tools enable the user to get work done in many "tight spots" otherwise inaccessible. They have adjustable speeds to meet various operating requirements.
*INFORM-A-GRAM KEY No. 195-P*

**PRODUCTION REAMING TOOLS**—A new 32-page Catalog, No. 21, on reaming operations and their effect on final cost has just been published by the MADISON MFG. CO., Dept. T, Muskegon, Mich. Keynoting the entire publication is the simplicity of design and operation of Madison Adjustable Reaming Tools. A one-screw adjusting feature allows a precision adjustment of the Madison cutter with an ordinary screw driver. Interchangeability of cutters in the bar through pre-sizing, gives the operator a more versatile tool, allowing many different diameters to be reamed with a bar and a number of cutters.
*INFORM-A-GRAM KEY No. B19-P*

"UNBRAKO" Knurled Head Socket Cap Screw

Knurling of Socket Screws originated with "UNBRAKO" years ago.

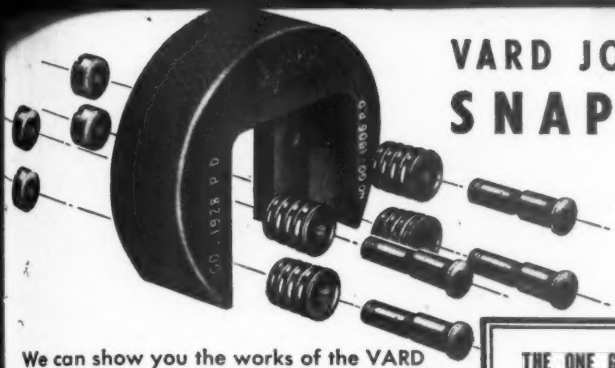
UNBRAKO
Reg. U. S. Pat. Off.

SOCKET CAP SCREW
*with the knurled head*

. . . known throughout industry as the time saving Socket Cap. That's because the fingers become firmly geared to the knurls in a non-slip grip that defies all grease, and lost motion. Knurls also provide a better grip for making minor adjustments with pliers. Know more about it. Send for "UNBRAKO" catalog.

OVER 40 YEARS IN BUSINESS
STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNA. BOX 600
— BRANCHES —
BOSTON · DETROIT · INDIANAPOLIS · CHICAGO · ST. LOUIS · SAN FRANCISCO

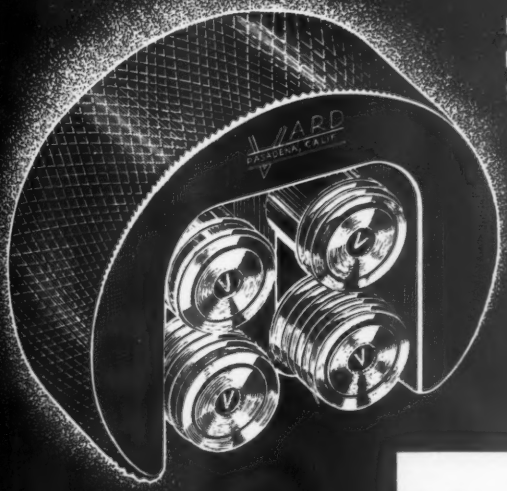
# VARD JOHN-SONS
# SNAP GAGE



We can show you the works of the VARD Model VC Roll Thread Snap Gage, but pictures can never tell how much this gage can speed up your inspection of small threaded parts. Instead of screwing a pair of ring gages on and off the work, one pass of the threaded part through the gage rolls will instantly show up inaccuracies in lead, thread form, pitch diameter, roundness and straightness. Correctly cut threads should pass through the GO gage rolls and not pass the NO GO gage rolls. This gage fits into the hand or can be held in a stand.

**THE ONE GAGE CHECKS BOTH RIGHT AND LEFT HAND THREADS**

**Gage frame machined from block of steel. Sharp machine knurled grip. Tool steel gage rolls, hardened, ground and lapped. Eccentric pins permit adjustment for wear. Locknuts hold setting securely.**




MADE IN SIZES TO GAGE THREADS FROM NO. 0 TO NO. 12, AND IN ALL STANDARD THREAD FORMS.

**VARD INC.**

PASADENA 8, CALIFORNIA

**MICROFILMING**—A new and improved application of microfilming to pencil engineering drawings made on transparent paper, as well as other valuable records, documents, drawings, maps and materials is described in a new bulletin, "Hold Everything," issued by MICROCOPY CORP., Dept. DJ, 2800 W. Olive Ave., Burbank, Calif. Advantages in time, savings in money, and document-insurance features provided by the Microcopy microfilming process, known as the Translite Hi-Reduction Microfilm process are pointed out. This illustrated bulletin demonstrates savings in space provided by the service, as well as describing the new Microcopy Multiple-Magnification Viewer for reading Microcopy reproductions on film.
*INFORM-A-GRAM KEY No. B8-P*

**SAFE LUBRICATION** of high-up bearings is the subject of an illustrated booklet recently issued by the FARVAL CORP., Dept. D, 3248 E. 80th St., Cleveland 4, Ohio. Elimination of the hazards due to the manual lubrication of high-up and hard-to-get-at bearings on presses, cranes and other "off the floor" types of equipment is discussed. This bulletin, "Aloft is no Place for A.W.O.L. (absent without lubrication) Bearings", explains the applications of the Farval Dualine system for sending lubricant under pressure from a central pumping unit to every bearing on the machine. The dangers of personnel accidents, as well as of shutdowns caused by faulty lubrication by hand, are contrasted with the safety and certainty obtained through the Farval method.
*INFORM-A-GRAM KEY No. 413-P*

**ACCESSORIES** for grinding, buffing and polishing machines are illustrated in a series of leaflets issued by the DIVINE BROTHERS CO., Dept. TJ, Utica, N. Y. Compress Contact Rolls provide the belt with a resilient backing at the point of contact with the work, run true, have an even face on which the belt travels and require no trimming. Segment Face Contact Rolls have a relatively hard, even cushion which provides a true smooth surface for belt travel, and a soft resilient center which furnishes a flexing action. Red D Buffs simplify the job of buffing flat and contoured surfaces and materials which include brass and stainless steel sheets and plastic; also for cutting down and buffing lamp bodies, reflectors, percolators and cooking utensils.
*INFORM-A-GRAM KEY No. B10-P*

**SHOCK-ABSORBING HAMMERS & MALLETS**—Basa Replaceable Face Hammers and Empire Soft Face Mallets are illustrated in a new bulletin issued by GREENE, TWEED & CO., Dept. D, Bronx Blvd. at 238th St., New York 66, N. Y. Features of special interest are the plastic faces and heads which are now available for these hammers and mallets. Rawhide


NEW! Hammond

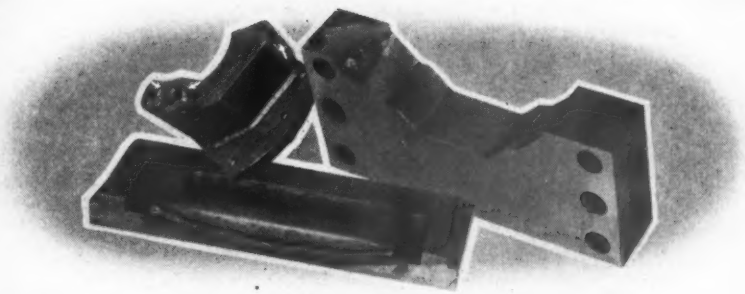
10" and 14" WET TOOL GRINDERS FOR CARBIDE TOOLS and HI SPEED, Too!

Grinding wet, helps prevent tool tip crazing and flaking, and eliminates heat cracks.

New features of the Hammond 10 and 14: No Spray-No Splash concealed wheel guards provide greater operator freedom and complete visibility of work; Adjustable Coolant spouts swivel in and out with flooding action of the coolant; Safety Cup disc prevents operator from accidental dropping of tool into cup of cup wheel.

SEND FOR BULLETIN NO. 206

Hammond Machinery Builders INC.
KALAMAZOO 54, MICHIGAN
1631 DOUGLAS AVENUE
Eastern Branch—71 W. 23rd St., New York 10, N. Y.



# Welds That Save Fifty Times Their Cost

**When one welding dollar saves a fifty dollar investment from the scrap pile —that's profitable welding and just a conservative example of what welders are doing on "hard-to-weld" metals with PHILLIPS CRUCIBLE ARC Electrodes.**

**Hundreds of shops are arc welding those hard-to-weld metals and alloys as easily as they would weld mild steel. They've been doing it for years. It isn't hard—it's just a matter of "knowing how" and using the right materials.**

**More than 120 different welding materials are regularly stocked by C. E. Phillips & Company—a rod for every weldable metal and alloy. For more than 20 years our engineering staff has been accumulating data on specialty welding problems. You will find it profitable to draw upon this experience.**

**THESE NEW WELDING MANUALS ARE *FREE***

***4 Ways to Salvage, Reclaim and Conserve Iron Castings by Electric Arc Welding***
Tells how to select electrode material for various job requirements, and gives full details of procedures to use for best results with each material.

***Arc Welding in the Maintenance and Construction of Tools and Dies***
Explains the theory, outlines procedures and furnishes the engineering data which you need for successful welding in the tool and die shop.

Either one or both of these valuable books will be sent promptly on request, and without obligation.

★

C. E. PHILLIPS & COMPANY

2750 Poplar Street, Detroit 8, Michigan ● 332 So. Jefferson St., Chicago 6, Illinois

MANUFACTURERS AND DISTRIBUTORS OF WELDING ELECTRODES AND SPECIALTIES

copper or babbitt faces can also be furnished for the Basa Hammers, and plain or loaded rawhide heads for the Empire Mallets. In addition, the bulletin outlines the various distinctive features of these tools; including the split adjustable heads of Basa Hammers which enable the interchangeable faces to be replaced within a few seconds, and the carefully distributed weight of both hammers and mallets which permits blows to be struck without transmitting shocks which would cause fatigue of the user.
*INFORM-A-GRAM KEY No. 782-P*

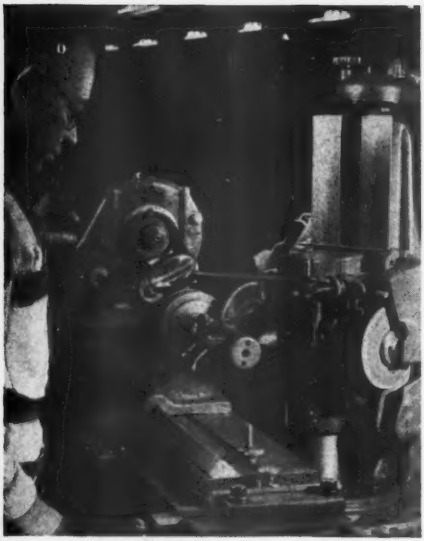
**BOICE-CRANE PURCHASE PLAN**—An illustrated booklet describing a convenient purchase plan for forward-looking shop men and home craftsmen who need shop tools, but have been unable to obtain them because of priority restrictions, has been issued by BOICE-CRANE CO., Dept. TJ, 963 Central Ave., Toledo 6, Ohio, manufacturer of power tools. By this Purchase Priority Plan, machine tools may be obtained at the earliest possible moment and payment arranged out of patriotic savings in War Bonds. New literature on the Boice-Crane line of band saws, saw jointers, jig saws, belt sanders, spindle sanders, spindle shapers, drill presses, lathes and thickness planers is also available.
*INFORM-A-GRAM KEY No. 145-P*

**TAPER-LOCK, TRI-LOCK & RING BLANKS**, ready for finish grind, are now available from large inventories of BASSETT, BROCK & TAYLOR, Dept. D, 11706 Woodward Ave., Detroit 3, Mich. Size ranges are from .029" to 1.510" in taper-lock blanks, and from 1.510" to 3.510" in tri-lock blanks. All blanks are made from Carpenter's Stentor OHTS for long wearing quality. Shanks and faces are ground. Blanks are hardened and drawn to Rockwell "C" scale 62-64. Centers are clean, true, 60° lapped bearing surfaces. Solid hardness allows for salvaging. Literature and prices are available.
*INFORM-A-GRAM KEY No. B11-P*

**MULTIPLE DRILLING HEADS** are presented in a 28-page illustrated booklet entitled "Passport to Progress" issued by the HOEFER MFG. CO., Dept. TD, Freeport, Ill. Hoefer Heads are attachable to your own drill presses or turret lathes and save floor space as well as cost of new machines. They have been produced for a wide variety of applications.
*INFORM-A-GRAM KEY No. 308-P*

**SPOTTING & CENTERING DRILLS**—These high-speed drills, made with shorter flutes and overall length than regular drills, are illustrated and described in a circular recently published by WHITMAN & BARNES, Division of United Drill & Tool Corp., Dept. TD, 2108 W. Fort St., Detroit 16, Mich. The short overall length permits the drill to be gripped

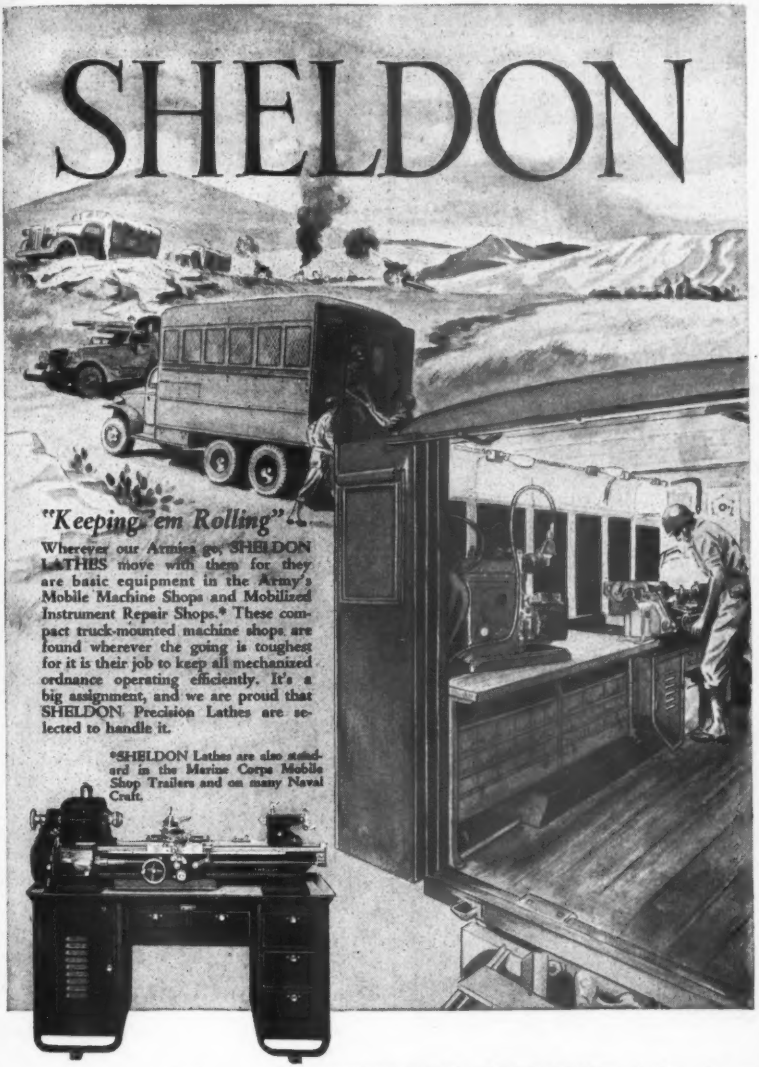

## Gage Precision to Rigid Tolerances...



Tooling-up for postwar production will be just as important as tooling-up for war. Peacetime competition will demand careful consideration of all the factors that affect costs and quality. Haines engineers are prepared to work with you now on your gage problems. Write for illustrated circular or outline your problems. HAINES GAUGE CO., 23rd and Allegheny Ave., Philadelphia 32, Pa.

*Haines*
**PRECISION GAGES**
PLUG • RING • SNAP • FLUSH PIN • PROFILE • ETC.

# SHELDON



*"Keeping 'em Rolling"...*

Wherever our Armies go, SHELDON LATHES move with them for they are basic equipment in the Army's Mobile Machine Shops and Mobilized Instrument Repair Shops.* These compact truck-mounted machine shops are found wherever the going is toughest for it is their job to keep all mechanized ordnance operating efficiently. It's a big assignment, and we are proud that SHELDON Precision Lathes are selected to handle it.

*SHELDON Lathes are also standard in the Marine Corps Mobile Shop Trailers and on many Naval Craft.



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closer to the point and results in a true start or center. The follow-up drill will then produce holes which are in perfect alignment. Tap breakage can also be reduced when spotting drills are used before drilling.
*INFORM-A-GRAM KEY No. 502-P*


**Insure Drilling Accuracy with Universal Drill Bushings**

Universal Drill Bushings save valuable tool drills. Super finished bores insure accuracy and unexcelled wearing qualities. All standard sizes available. Write for catalog.

Army-Navy "E" Flag Two Stars | Fighter Plane Given by employees | 20% Employees Bond deduction

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN


**NEWTON AUTOMAT** which converts hand-operated turret-equipped bench lathes into reliable automatics is described in an illustrated leaflet issued by NEWTON MFG. CO., Dept. TD, 706 N. Heliotrope Dr., Los Angeles 27, Cal. Very simple in design and of rugged, enduring construction, it is as fool-proof as a mechanical device can be. The set of standard adjustable cams will handle almost any job. The member which actuates the cross slide is a torque rod which cushions the shock of forming and cut off operations; it also assures uniform feed, accurate repeating, and prolongs tool life. An automatic cut out, quickly adjustable to work of different character, eliminates tool spoilage and parts rejection.
*INFORM-A-GRAM KEY No. B15-P*

**RAPIDESIGN DETAILER**—A compact 9 in 1 ellipse instrument that does away with the use of angles, compass, rules and the usual lengthy methods of calculations is described and illustrated in a group of leaflets issued by MARTIN DESIGN STUDIOS, Dept. TD, 111-B Orange, Glendale, Cal. Each instrument, made of Du Pont "Pyralin", gives 17 ellipse sizes from 3/8" to 2¾" wide. This together with the complete three-piece set having 30°, 45°, 60° projections, covers the range of smaller ellipse sizes most difficult to lay out and most generally used in perspective drawing. This set is recommended for engineers, architects, draftsmen, artists and designers.
*INFORM-A-GRAM KEY No. A14-P*

**STEAM JET AGITATORS**—a complete series of Heil jets for the direct introduction of steam or air into corrosive solutions to heat them to the optimum temperatures is presented in Bulletin 43 released by HEIL ENGINEERING CO., Dept. T, 12901 Elmwood Ave., Cleveland 11, Ohio. These are designed to give agitation to any or all parts of the vats, increasing the mechanical scouring action and the complete chemical effect upon the contents to be treated. The information contained in this bulletin is of direct interest to those having a tank heating and agitating problem.
*INFORM-A-GRAM KEY No. 314-P*

**NEW WESTINGHOUSE CERAMIC PLASTIC. PRESTITE** is described in the company's booklet "Facts about Prestite". The product is a porcelain, molded under pressure and fired under controlled temperature. This results in a product without unrelieved internal stresses, uniform, strong, dense, and impervious to moisture. It can be glazed, painted, cored, or designed so that metal parts may be attached by soldering. The 12-page booklet contains photographs and diagrams of this process, as well as illustrations of the design and applications, together with the mechanical characteristics. Address WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, East Pittsburgh, Penna.
*INFORM-A-GRAM KEY No. 35-P*

# GORTON

SPECIALISTS FOR OVER 50 YEARS IN

## Tracer-Controlled MILLING

6 mm. movie camera case profiled in large quantities

### TRACER CONTROL Proven

## FASTER METHOD FOR HIGH PRODUCTION PROFILING

**High Accuracy and Finer Finish Maintained . . . Production Doubled**

An American camera manufacturer found the Gorton Duplicator the ideal machine for high production profiling of both seat for cover and film tract clearance of camera cases, holding tolerances of ±.003". Gorton high spindle speeds produced the required fine finish.

SIMPLE HEAT-TREATED MASTER determines cutter path. For high production, pneumatic clamping provides easy loading and unloading and simultaneously regulates flow of coolant.

On jobs like this, the Gorton Duplicator permits any reasonably good operator to perform satisfactory work, maintaining high accuracy, comparable to results of highly skilled mechanics on special production equipment.

**PRODUCTION DATA**

**Operation**—Profiling to fine finish.
**Material**—Aluminum alloy.
**Speed**—4,000 r.p.m.
**Feed**—Manual.
**Production**—30 per hour.
**Previous Method**—15 per hour.

### GORTON ENGINEERING SERVICE, FREE

Investigate the possibilities of the Gorton Duplicator as the practical, economical solution to your high production profiling problems. Gorton engineers who have specialized for 50 years in the development of tracer-controlled milling will give you their recommendations without obligation. Submit part, prints or specifications to your Gorton dealer, or Factory at Racine, Wis.

The Right Size The Right Type of Machine for Every Job . . .
From 2 oz. to 2 ton

DIE BLOCKS

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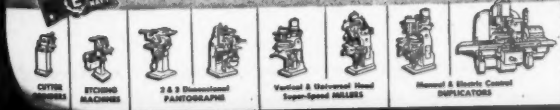
Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON Precision MACHINES



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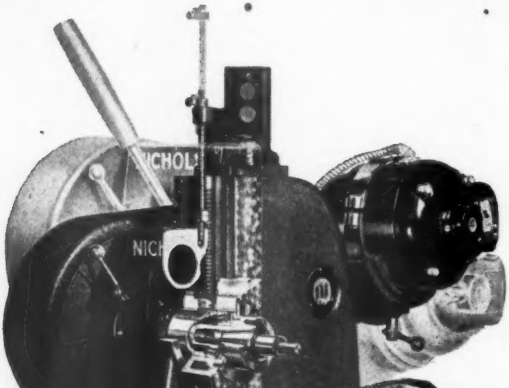
# HOW THE NICHOLS MILLER USES ITS HEAD



Bringing the cutter on a sliding head down to the work is a basic principle of the Nichols Miller, a *plus* factor that gives it decided advantages over other milling machines.

This manually controlled rise-and-fall spindle assures multi-purpose flexibility with simplified set-ups... contour milling, form straddle milling and fly-cutting, among others, which would require far more intricate and expensive machine tools.

That's why on production lines and in toolrooms everywhere you can see Nichols Millers performing dozens of different high-speed machining operations—doing the work of precision boring machines, lathes, and grinders...*to tolerances in "tenths".*

Your present and post-war production requires precision and flexibility. You get both in the Nichols Miller. Investigate its many advantages today.

## THE NICHOLS MILLER

"THE MILLER THAT USES ITS HEAD" • MFD. BY W. H. NICHOLS & SONS, WALTHAM, MASS.

*National Distributors:*
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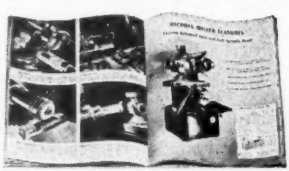

**Free Brochure** on Nichols Miller applications is yours for the asking.

# SHOP AIDS

## for YOU and YOUR JOB!

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**ARC WELDING PROCEDURES FOR CAST IRON**—Much of the confusion and controversy which has surrounded the subject of making repairs on iron castings by electric arc welding is dispelled in a 12-page illustrated booklet, "4 Ways to Salvage, Reclaim and Conserve Iron Castings by Electric Arc Welding," which has just been published by C. E. Phillips & Company, Dept. J., 2750 Poplar Street, Detroit, Michigan. This treatise opens with a frank discussion of the inherent difficulties which will be encountered in arc welding cast iron, and points out that there is no single welding material or procedure which can be recommended as a universal practice. It is emphasized that the selection of a procedure for a specific application should be based on the requirements of the finished job. Four types of electrodes for use on cast iron are described, and the characteristics and best welding procedures for each are explained. Microphotographs of deposits made by the various electrodes are used to show the penetration, the grain structure at the fusion zone, and the grain structure of the deposit. Of particular interest to many foundries and machine shops is the discussion of the Phillips "600" non-ferrous electrode which produces deposits of the color of cast iron, and which can be machined through the line of fusion.
*INFORM-A-GRAM KEY No. A24-P*

**A NEW HEAT-TREATING GUIDE** which should prove a great convenience and time saver in the busy tool room has just been completed by the CARPENTER STEEL CO., Dept. J, 306 W. Bern St., Reading, Pa. Complete information on the heat treatment of all Carpenter matched tool steels is given. At a glance the heat treater can find the following information for each steel: type analysis, forging heat, normalizing heat, annealing treatment, hardening treatment, furnace atmosphere, and recommended drawing range. In addition, he can determine for each steel on the chart the hardness for various drawing temperatures. Tool designers and tool room foremen will also find this guide useful.
*INFORM-A-GRAM KEY No. B38-P*

**GYPSUM CEMENT PATTERNS AND MODELS**—An extremely clear and comprehensive manual, "How to Make Patterns and Models with Gypsum Cement," has been released by the United States Gypsum Company, Industrial Division, 200 West Adams Street, Chicago 6, Illinois.

The advantages and benefits of patterns and models made of gypsum cement are listed as follows: 1. Savings in pattern making time, 2. Accuracy and stability of dimensions, 3. Adaptability to complex contours and intersections, 4. Ease of producing sectional dies from full scale mock-ups, 5. Flexibility of design in making complicated mock-ups and check fixtures.

Special gypsum cements have been developed to meet the requirements of the foundry and metal forming industry, and this booklet, it is stressed, supplies **basic** information for using these cements. The booklet shows exactly how to make highly accurate master patterns from gypsum cement. Each step is illustrated photographically, and the various stages of plasticity, in particular, are illustrated with greater clarity than one would believe possible, since actual handling is generally considered necessary to "get the feel" of the textural development, from liquid to solid.

The instructions for working are comprehensive and exceptionally clear, ranging from illustrations of the shop equipment and tools through the specifications for mixing the cement, making the templates, and forming the patterns. Each step of the procedure is clearly illustrated, and the forming of patterns for straight moulding, square, rectangular or oblique shapes, circular and cylindrical shapes, is shown, step by step. This is a most valuable publication even from a general-interest standpoint, and should be most useful to those engaged in making models and patterns.
*INFORM-A-GRAM KEY No. B45-P*

**WHEEL DRESSING INSTRUCTIONS** — Presenting special "how to" information never

## SHOP AIDS

before published, "INSIDE FACTS ABOUT DRESSING," an instructive booklet on angle-tangent-to-radius dressing and related shop problems, has been published by Perfex Dresser Corporation, Detroit.

This new 16-page booklet, just off the press, is written and illustrated to help the man at the machine. It explains in simple terms, and in an entertaining manner, how to avoid chatter, how to eliminate wheel marks, how to prevent diamond wear, how to check accuracy without making templates, how to prevent "overshooting" of radii, etc.

The booklet covers all phases of plain radius dressing, plain angle dressing and angle-tangent-to-radius dressing. By furnishing specific "do's and don'ts" it helps the operator avoid common troubles and gain greater accuracy in his work, regardless of whether or not he is using a Perfex Dresser. In all, "INSIDE FACTS ABOUT DRESSING" gives 47 practical tips on how to solve difficult dressing problems, in addition to suggesting new and better ways to short-cut operations and save time.

"INSIDE FACTS ABOUT DRESSING" will be sent gratis, in any quantity desired, to any plant requesting copies. Write PERFEX DRESSER CORPORATION, Dept. D, 3608 Gaylord Avenue, Detroit 12, Michigan.
*INFORM-A-GRAM KEY No. 560-P*

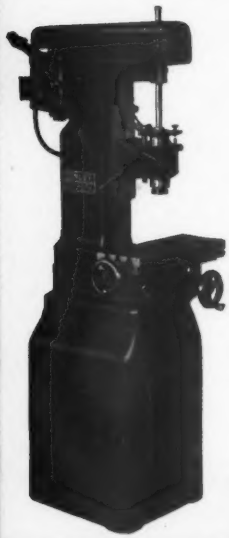
**WELDING SYMBOLS WALL CHART**—An entirely new and informative wall chart, illustrating the basic characters of welding symbols recommended as American Standard by The American Welding Society, has been published by The Hobart Brothers Company, Dept. T., Troy, Ohio, one of the world's largest builders of arc welders and equipment.

The graphical language of the welding industry is illustrated separately for Fusion Welding, for Resistance Welding, and for those techniques requiring both Fusion and Resistance Welding. The location of the symbols, numerical and other data on the reference line always has definite significance and this is illustrated to show the standard manner of placing proper information on symbols.

Twenty-three typical welded joints and sections, covering butt welds, lap welds, tee welds, corner welds, and edge welds, are well illustrated and marked with the standard welding symbols applying to that particular joint or section.

These symbols provide the means of placing complete welding information on the drawings. The Hobart Welding Symbol Chart, printed in three colors on heavy paper suitable for hanging on the wall of the drafting room and welding booth will be sent without charge to designers, inspectors, welding operators and others concerned with the safety and efficiency of welding fabrication.
*INFORM-A-GRAM KEY No. B3-P*


# OPENS UP BOTTLE NECKS
## *in busy* TOOLROOMS



**The little, fussy jobs that continuously confront busy shops cause plenty of confusion . . . especially when they're scheduled for larger-than-required machines. A good solution is to buy a LINLEY . . . or several of them.**

## *High Speed* MILLING...JIG BORING

**High speed MILLING-JIG BORING and all such jobs as die work, model making, metal patterns, jigs, fixtures, drilling, reaming, etc., are the natural work for the LINLEY. It provides 8 speeds, 275 to 4250 r. p. m., direct micrometer setting, velvet feed, counterbalanced quill (no backlash), generous table size and travel, minimum floor space requirement. Investigate this compact, precision machine . . . it's a real time and money saver.**

***Engineering data and folder on request***

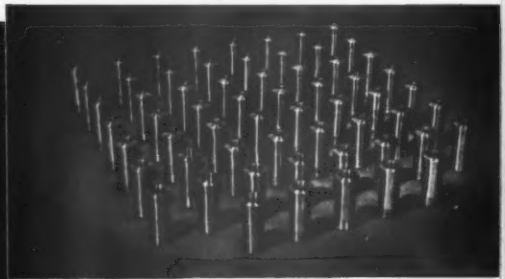
**LINLEY** BROTHERS COMPANY
662 STATE STREET EXTENSION
BRIDGEPORT 1, CONN.

# Versatility
## *for Precision Toolroom Work*

The ease with which South Bend Toolroom Lathes can be changed from one set-up to another for an almost unlimited variety of precision operations is one of the reasons for their popularity in the busy toolrooms of war-rushed essential industries.

Convenient, well placed controls; easy reading graduated dials; and smooth operation save time and reduce operator fatigue to a minimum. A wide range of spindle speeds permits machining various kinds of metals with maximum cutting tool efficiency. Threads and power feeds for all requirements are instantly available through a full quick change gear mechanism. A complete line of attachments and accessories simplifies tooling lathes for many special and unusual classes of toolroom work.

South Bend Toolroom Lathes and Engine Lathes are made in five sizes: 9", 10", 13", 14½", and 16" swing respectively. Precision Turret Lathes are available in two sizes: Series 900 with 9" swing and ½" collet capacity and Series 1000 with 10" swing and 1" collet capacity. Write today for catalog.



### COLLETS

Collets for all sizes and types of South Bend Lathes are now being shipped directly from stock. All sizes from 1/16" to 1" diameter in steps of 1/64" are available.

A complete set of collets is especially helpful. Often the time saved by having on hand the right size collet for a single rush job will more than compensate for the cost of a full set of these fine collets.

Check your collet requirements today—for toolroom, maintenance, and production work—and order all you need. Specify size and serial number of lathe.

*BUY WAR BONDS—SAVE FOR LATHES*

**SOUTH BEND LATHE WORKS**

**South Bend 22, Indiana • Lathe Builders For 37 Years**

**"STEEL AIRCRAFT MATERIALS AND APPLICATIONS"** is a handsome 80-page brochure published by the Carnegie-Illinois Steel Corporation explaining the uses of steel in aircraft as well as including steel specifications and other data useful to those interested in aviation. The booklet is beautifully illustrated and assembled beginning with the explanation of "Why a Plane Flies" and following with types of engines, wing and rudder types, landing gears, pontoons and Army and Navy battle planes, all in silhouette form. Twelve pages are devoted to actual photos of Army and Navy planes, listing the model numbers, manufacturers' specifications and performance reports. Following these are assembled and "exploded" views of engines, propellers and landing gears, showing steel applications. One section includes briefs of Army, Navy and Air Corps specifications, Steel Aircraft Parts and their SAE (Soc. of Automotive Engineers), AMS (Aeronautical Material Specifications), and AISI (American Iron and Steel Institute) designations. There is an alphabetical list of aircraft parts and a separate list of parts made from various qualities of stainless steel with their corresponding specifications. This booklet should be of great interest to those who build these planes and to those who fly them.
*INFORM-A-GRAM KEY No. 925-P*

**MATERIALS AND PROCESSES.** Edited by James F. Young, Engineering General Division, General Electric Company, Schenectady, N. Y., this book is one of a series written in the interest of the General Electric Advanced Engineering Program. The purpose of the book is to present, in one volume, a broad study of the materials and manufacturing processes employed by the design engineer, and thus to provide information directly useful in the selection of materials for design. It is intended for convenient reference and for textbook use —and has therefore been organized for ease in classroom presentation and in such manner as, it is hoped, will give the practicing engineer or designer an over-all picture of the subjects discussed. The text covers chiefly the materials and processes used in manufacturing electro-mechanical products. Sufficient metallurgy is included to enable the engineer to understand heat treating practice and to appreciate the effects of the various methods on metallic materials. In the discussion of processes, enough detail for understanding the basic nature of each is given; but, throughout, emphasis is laid on designing so that products can be easily processed. Published by John Wiley & Sons, Inc., New York. Price, $5.00.

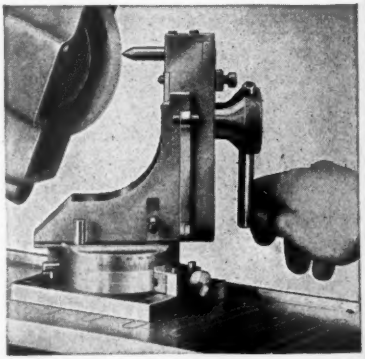

USE

*Fluid-motion*

*for modern form-dressing*

**ONE** SETTING
HANDLE
CONTINUOUS MOTION

The J & S Model "E" Radii and Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable — regardless of cost.



*FEATURES*

Fluid-motion dressing
.0001" accuracy
Automatic centering
14" wheel capacity
Large range yet compact
Chatterless and dustproof

**J. & S. TOOL CO.**

**477 MAIN ST. E. ORANGE 4, N. J.**

FOR *SPEED* AND *PERFORMANCE!*

Reciprocating Action (Push and Pull)

# PORTABLE *Electric* TOOL

*Mfg. by*
*H & H RESEARCH CO.*
*Detroit, Mich.*

*Used for . . .*

- FILING
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- SCRAPING
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- LAPPING
- SANDING
- CHAMFERING
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- SAWING

The reciprocating or "push and pull" action distinguishes this Portable Electric Tool from the rotary type of portable tools. Short forward and backward strokes enable the operator to perform accurately and speedily in tight corners and hard-to-reach or otherwise inaccessible places. Universal motor operates from any 110 Volt outlet and develops a 30 to 40 pound push-and-pull stroke at the rate of 1000 per minute.

Lightweight . . . weighing only five pounds . . . it is handled easily by man or woman.

Send today for specifications and details including complete assortment of accessories available for use with the Portable Electric Tool.

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High-Speed BENCH
SURFACE GRINDER

ACCURATE WITHIN .0001

New Features

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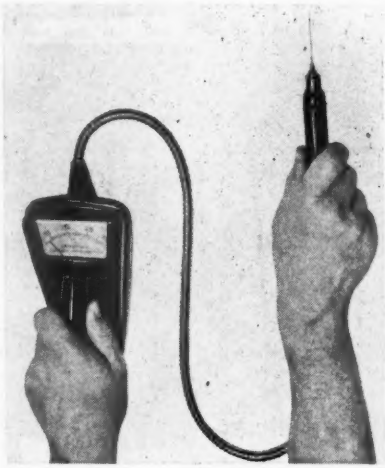
Irvington II, N. J.

## Needle Pyrometer for Preforms

The Cambridge needle pyrometer, designed for and in wide use to obtain subsurface temperatures of plastics and rubber masses, has found a new and very important use in determining the temperature of preforms, according to

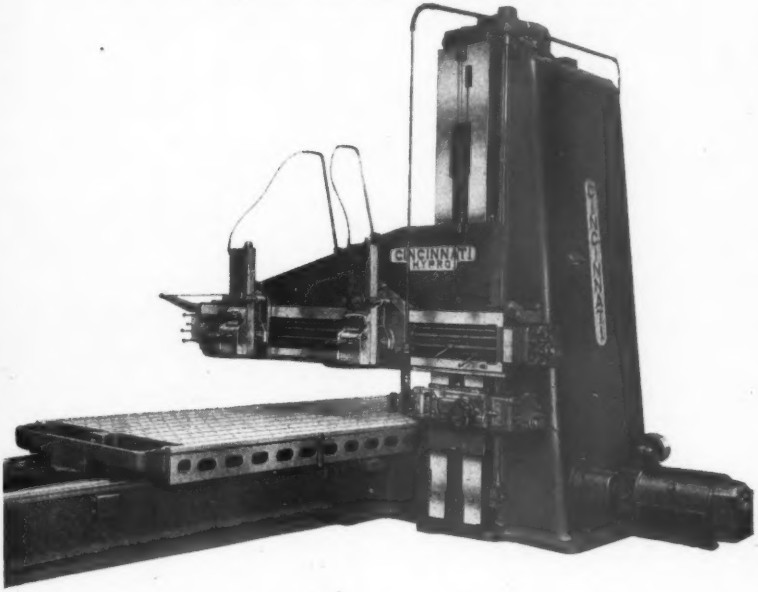


the manufacturer, Cambridge Instrument Company, Inc., Dept. TD, 3752 Grand Central Terminal, New York 17, N. Y. Preforms of either thermosetting or thermoplastic materials heated by high frequency (dielectric or radio frequency) can be checked for uniformity of heating by inserting the needle into the preform. The needle pyrometer provides a means of adjusting the time-cycle of the preheater for close temperature work.

The Cambridge Instrument Company manufactures a line of surface pyrometers, each being designed for a special purpose. The mold model was developed to meet a widespread demand for a fast, accurate means of measuring the internal temperature of molds for plastics materials. It is also widely used for many surface temperature problems in the plastics industry. Cambridge roll pyrometers are also in wide use in a number of industries.

*INFORM-A-GRAM KEY No. 774-P*

# Cincinnati Hypro Openside Planers Can Help You Retool for Peace




- The war isn't won yet. But when peace does come you will want to tool up quickly and economically. That's when Cincinnati Hypro Openside Planers can help. It may be next month, next year or the year after but you will want a planer that can handle all sorts of shapes and sizes. You will want it to absorb the strain of heavy cutting without losing accuracy.

- You will find the Cincinnati Hypro Openside is exceptionally strong and rigid with an extra heavy, wide faced column for positive rail clamping and support to the side head.

- Cincinnati Hypro Openside Planers increase production and provide tool room accuracy. Write for Bulletin 110 describing them.

**PLANERS · PLANER MILLERS · BORING MILLS**

**THE CINCINNATI PLANER CO.**

**CINCINNATI, OHIO**

Johnson Furnaces

**2300° F. in 30 Minutes**
**with this No. 120 Johnson**
**Hi-Speed Steel Furnace**

*Reaches 1500° in 5 minutes*

**Unexcelled for heat-treating hi-speed steels, for hardening dies, punches and tools. Compact, powerful and remarkably economical to operate. Firebox 13½" long, 7¾" wide, 5" high. Carbofrax hearth, insulating refractory lined, and equipped complete with G.E. motor and Johnson Blower.**

**$129.50**
**F.O.B. Factory**

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**624 E. Ave., N. W., Cedar Rapids, Iowa**
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## Plexiglas Masking Jigs

The Morganite Company, Long Island City, N. Y., manufacturers of carbon specialties, have found Plexiglas masking jigs very satisfactory in the copper plating of carbon rings. The previously used materials were seriously limited and the search for a satisfactory replacement was ended with the use of Plexiglas. This clear acrylic was selected because of its machinability, dimensional stability and light weight. It was found that rejections were reduced and that production rates were stepped up.

The carbon rings to be plated are inserted in grooves $\frac{1}{64}$" wide on either side of the Plexiglas jig rings. They are then mounted gang-fashion on a carbon rod; electrodes are attached and the entire assembly is suspended in a plating solution. The top picture shows a series of Plexiglas masking jigs mounted on a carbon rod. The durability of these jigs and their resistance to the plating solution make them highly practical. The lower picture shows the carbon rings plated except for the narrow rim protected by the masking jig as they are removed from the rod.

*INFORM-A-GRAM KEY No. B46-P*

# UNDERWOOD ELLIOTT-FISHER CO. MAKES PRODUCTION RECORDS ON CARBINE BARRELS

## . . . with L&I Reamers

By developing new procedure and new tool designs, Underwood has made production history in turning out .30 calibre M-1 carbine barrels. Special L & I reamers were used on this job.

**We quote from *The Iron Age*, May 25, 1944:**

"Perhaps the most important operation on the barrel is reaming. Baush 12 spindle hydraulic deep hole reaming machines are used, with six fluted push reamers. The reamers have three alternate lips relieved 1⅝ in. from the end for chip clearance. The barrel hole is rough reamed to 0.296-0.297 in. and finish reamed to 0.300-0.302 in. in diameter at the unconventional feed of 14 in. per min. This *feed is three times faster than genenally recommended* for this operation *and the remarkable feature is that the hole is finished with two reams where it formerly required three and four reams.*"

To achieve similar improved reamer production,
send us a trial order, or write for literature.

L&I **GROUND FLUTE REAMERS**

**LAVALLEE & IDE, INC. CHICOPEE, MASS.**

(CONTINUED FROM P. 156)

$3,460 a month, according to Mr. Coonce.

Conservation of paper, burlap, rags and rubber is also an important part of the program, these materials being carefully collected, sorted and prepared for disposal in order to realize their highest utility value.

**Gas Turbine Power Units**

Record attendance at two California meetings of engineers to hear about the possibilities of gas turbines for certain land, sea and air applications, indicates that the West Coast may become the proving ground for gas turbine power units. When J. Kenneth Salisbury of General Electric's turbine engineering division spoke recently on the subject of the gas turbine, its characteristics and potentialities, an all-time high attendance record was established for an ASME meeting or any technical gathering in Los Angeles. The meeting drew 1000, in contrast to the usual attendance of 35 to 40 at technical meetings, and around 200 at general monthly meetings.

Salisbury told the audience that use of the gas turbine in locomotives is the most promising application at present and he revealed that G-E has made studies of a 4500-hp locomotive powered by a single gas turbine unit, with a regenerator and a waste heat boiler. Among the advantages are the thermal efficiency of this locomotive, its ease of assembly, accessibility, light weight, and smooth flow of power. The G-E engineer exhibited a scale model of a 3000-hp turbine power plant designed for marine use, indicating another field of application being studied by his company along with that of the gas turbine in the post-war cargo and transport plane field. Present factors point to 2000 to 8000-hp as the future range of size for aircraft engines and he said that it is in that range that the gas turbine will offer the greatest advantages for air power. Salisbury's talk drew another record crowd of more than 300 a few days later at a San Diego meeting sponsored jointly by the Society of Automotive Engineers and the Institute of Aeronautical Sciences.


DOES THE WORK OF LARGE HIGH PRICED MACHINES

SPEED - ACCURACY - on 95% of All Cut-off Work

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If you are cutting bars, angles or tubes to lengths, this is the NEW, MODERN, ECONOMICAL METHOD.

Low cost recommends it for SAVINGS and EFFICIENCY on hundreds of jobs.

Two sizes — 8" x 16" and 8" x 24". Four speeds for any metal.

DRY MODEL—Machine illustrated is suitable for all intermittent cutting. All models portable and plug into light socket. Casters optional.

WET MODEL—Machine with coolant permits high speed, production cutting. Attachment operates clean and does not interfere with convenience or portability.

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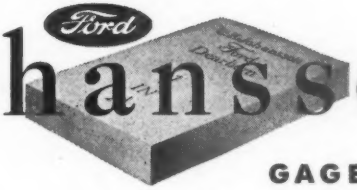


GAGE BLOCKS

***Write for Catalog 16 to*** FORD MOTOR COMPANY
***Johansson Gage Division • Dept. TD, Dearborn, Mich.***

## Safety Through Management Leadership

Pointing out that American industry has exhausted just about every source of manpower except one—the reserve now wasted by industrial accidents, the U. S. Department of Labor, Division of Labor Standards, has prepared a special booklet outlining how war plants can "insulate" their plants against accidents. Aimed primarily at the smaller war plants which can rarely employ safety engineers, the booklet cites actual experiences of plants of varying sizes in organizing for safety.

Stressing the vital necesssity of management leadership in any safety program, the booklet shows that safety, like policy or procedure, works from the top down through the organization, hence everyone in supervision must fully understand first, what is wanted, and second, just what to do about it.

In order to make headway with a safety program, three other steps are also required—effective organization, thorough training, and good supervision. Actual examples of programs now operating in small, medium and large plants are outlined. Talking directly to management, the bulletin points out: "The first step in proving that you mean business when you talk safety is to make your plant safe and healthful with safe machinery and equipment, and to provide for safe methods of operation".

Free copies of "Safety Through Management Leadership", may be secured from the Division of Labor Standards, U. S. Department of Labor, Washington 25, D. C.

## Goodrich Flashlight Storage Battery

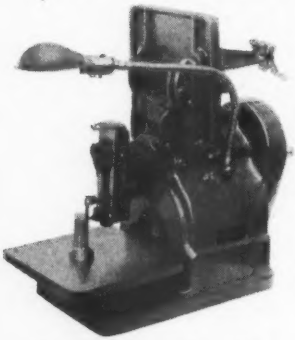
A rechargeable wet flashlight battery for industrial use, built on the principle of the automobile wet storage battery and especially valuable for operations where long continued and steady usage of flashlights is necessary is announced by the B. F. Goodrich Company, Akron, Ohio.

Tests conducted in its own and other


*The* **"DUPLEX"** *machine-files*

FLANGED PUNCHES - BLIND CAVITIES - MOULDS - DIES

Uses a controlled downward movement with an adjustable stroke.



DIES filed on upper table when swung down.

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No. 2 (Sine of 5') TILTS ONE WAY as Sine Bar. Opens Three Inches Size, 6"x2½"x2¼"

No. 3 TILTS THREE WAYS Sine of 6" & 3" Size 7½"x3½"x2¾" Opens 3½"



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Features Include:

1. Precision Sine Rolls
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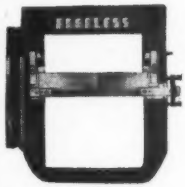
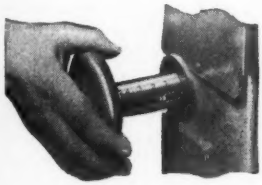
# THE NEW MECHANI-CUT

## PEERLESS
## Leads Again

**Production Superintendents want a FAST, ACCURATE-CUTTING Power Saw — a Saw that offers the simplicity of full mechanical drive — and PEERLESS meets that need with the new MECHANI-CUT!**




**THE MASSIVE FOUR-SIDED SAW-FRAME permits locating bearings above and below the Saw Blade. Hardened and ground renewable inserts take all the strain as the Saw-Frame reciprocates. Locked 1/32" above the blade, the Backing Plate adds rigidity and permits maximum blade pressures without undue injury to the blade.**



**THE COMPENSATING FEED UNIT is away from falling chips and coolant spray. Pressures are selected by the fingertip control. Highly sensitive rack and pinion feed compensates for hard spots in the metal and varying shapes, sizes and types of stock.**

● The MECHANI-CUT is built to last with minimum attention. It has the famous Peerless Patented Four-Sided Saw-Frame with Backing-Plate Blade-Support and Finger-Tip feed pressure control. Capacities of 7"x 7" —11" x 11"— and 14" x 14" meet the widest range of metal-sawing needs. Not only will the MECHANI-CUT help you wind up existing contract work but it will tie right into your post-war tooling plans. A manually-operated conveyor can be added on the job. Send for new bulletin — MC-51. Mail the coupon.

**PEERLESS**
**MACHINE COMPANY**
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large industrial plants over a period of 18 months indicate that the miniature wet battery is the answer to the expendable dry cell problem in many industrial operations, particularly at this time when dry cells are in critical supply and when long life is so important for uninterrupted flashlight service.

Records show that substantial savings result when the wet batteries replace dry cells. The batteries carry a six-month guarantee which authorizes replacement if failure is not due to abuse or misuse. Batteries can be used in the standard three- or five-cell dry battery case by the use of spacer plugs. Complete recharging and testing equipment is available.


**Grip tools tight — with Universal Collet Chucks**

Universal Collet Chuck with National Milling Machine Taper Shank. Also available with B&S, Morse and Straight Shank

Universal Collet Chucks grip tools as strong as solid steel. Automatic release spring and allowance for tool feed-out. Handy wrench grip. Ground threads and reduced locking effort. Write for catalog.

ARMY NAVY "E" Flag Two Stars

Fighter Plane Given by employees

20% 70% Employees Bond deduction

UNIVERSAL ENGINEERING CO.

FRANKENMUTH, MICHIGAN


## Indoor Climate Institute's Postwar Planning Conference

An educational campaign to acquaint the public and all branches of the building industry with scientific developments in the field of "controlled indoor climate" is being launched at the first Open Forum meeting of the Indoor Climate Institute in Detroit, Sept. 21 and 22.

Labeled as a Conservation and Postwar Planning Conference, the forum is timely and in keeping with the spirit of cooperation necessary to assist the public in going through the forthcoming winter with highly restricted fuel supplies due to the war. The annual meeting and election of officers of ICI will be held simultaneously with the forum.

The Indoor Climate Institute, Penobscote Bldg., Detroit, Mich., is organized to assist manufacturers and trade associations in the promotion of controlled indoor climate and is designed to serve as a clearing house of unprejudiced information. It is planned to conduct seminars at the Open Forum when committee chairmen will review the plans and objectives of the respective committees with members of the related industries participating in the discussions.

Anticipating early renewed activity in the building industry with the European war's end, the ICI will carry its educational program emphasizing the importance of controlled indoor climate to every community in the nation. The program is broad in scope, one of the major activities being a program of cooperation with industries, institutions of learning and the government in postwar personnel training to help in the reemployment of returning fighters.

# FAST, UNIFORM PART MARKING...

If the metal parts you manufacture require accurate marking or numbering for easy identification, this improved Mercury Type Holder is an outstanding help in simplifying your marking job!

This tool holds the *entire part number*—up to 20 characters if needed. Each character is rigidly aligned and held in place so that, with a single blow of a hammer, the entire number is clearly and neatly stamped on the part. It's fast, fool-proof—and entirely eliminates the time normally consumed when using dies for each separate letter or figure. Moreover, such common errors as wrong sequence, strike-overs, overlapping numbers, etc., are no longer a problem with the Mercury method!

And here's an outstanding feature: the Mercury Holder accommodates five type sizes, and all type is quickly interchangeable to meet a whole range of numbering needs. So, with even a single Holder and a selection of type sizes, you can be ready for *any* numbering job that comes along! The Mercury Holder is *compact*, important when working with small parts . . . it is of all-steel *machined* construction for long life . . . it has just four simple parts . . . and it has many other important features you should know about. Hardened and ground hand cut steel type is available in a full range of sizes.

Full details, including ordering data and specifications for both hand and press style holders, are available for the asking. Write Department D today!

**IMMEDIATE DELIVERY!**

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546 EAST 16TH STREET, LOS ANGELES 15, CALIFORNIA

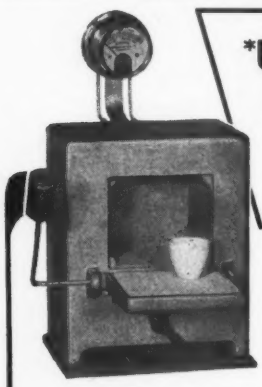
## A-C Welding Movie By G-E

A new two-part, all-color sound movie, "The Story of A-C Welding" has been announced by the General Electric Co. The new 16mm movie has been made available to all G-E arc-welding specialists and distributors, who will arrange to exhibit the film on request. Running time is about 35 minutes.

Produced under the technical supervision of the G-E laboratories, the film tells in detail, for the first time, the complete story of a-c arc welding and its many advantages. Expert welders demonstrate in scores of actual production-welding scenes the speed, flexibility and efficiency of the a-c process in all positions and on all types of joints. Laboratory demonstrations and clear close-ups of the arc and the molten steel show how the troublesome arc-blow, so characteristic of d-c welding, is eliminated by the use of alternating current. Animated sketches, interspersed at intervals, illustrate some of the more technical points in a popular manner.

The movie opens with an interesting and informative comparison between a-c and d-c welding which strongly emphasizes the basic differences between the two processes. What arc-blow is, how it interferes with production, and how it is counteracted by a-c welding, is next shown. Then the four major factors of a-c welding technique—current setting, travel speed, length of arc, and angle of electrode—are demonstrated in a series of brilliantly photographed close-ups. The advantage of using large electrodes and higher currents, made possible by a-c welding, concludes Part I of the film.

Part II begins with a detailed portrayal of the numerous profitable applications of a-c arc welding. Scene after scene depicts how the a-c process results in faster production, easier welding, lower cost, and more uniform high-quality welds on thick or thin material, in manual or machine welding, in any position, indoors or outdoors. Following this is a demonstration of how arc-blow affects the quality of the weld when the

***Uniform Temperature Handy . . . Portable Fast Heating**

• The heating element in the Temco furnace operates with unusual speed. A working temperature of 1500° F. is attained in only 30 minutes and intermittent peak loads of 1850° F. are within the practical range of this rugged, long life furnace. A four point switch provides temperature control in four ranges and adjustable rheostat bands allow close heat selection within any range. The accurate, dependable pyrometer is calibrated to 2000° F. and 1100° C. in 50° increments.

***MUFFLE CHAMBER** has the exclusive feature of an embedded heating element which covers all four sides of the heating chamber. This eliminates "cold spots", assures a uniform temperature in every part of the chamber, and protects the elements against damage and oxidation.

Temco furnaces are built for either 115 V. or 230 V. current consumption 1200 watt maximum. Heating chamber 4" wide, 3¾" high and deep. Outside dimensions 8¾"x 13½"x10". Shipping weight 30 lbs. **COMPLETE WITH PYROMETER (115 V.)..... $42.50**
*For 230 V.—$5.00 additional*

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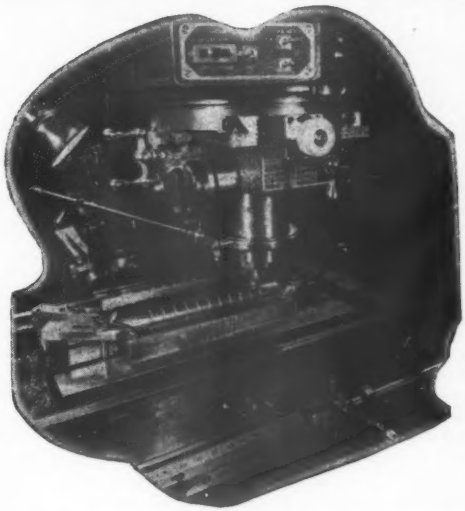
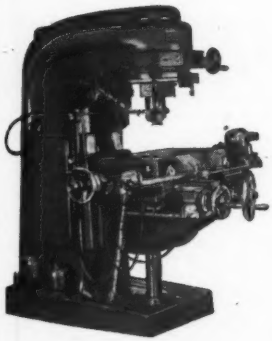
**TEMCO ELECTRIC FURNACE**

# ROTARY HEAD MILLER . . . PLUS CHERRYING ATTACHMENT . . . SIMPLIFIES THIS "*TRICKY*" MILLING OPERATION

The Milwaukee Rotary Head Miller equipped with a cherrying attachment made "short work" of the "*tricky*" milling required on this injection mold. It took just two hours to complete the job — far less time than by any other method known.

The cherrying attachment is an auxiliary rotary head, mounted at 90° to the head of the miller. It is used to mill circles and angles in a vertical plane. When used with rotary head motion, spherical and conical cavities can be accurately and rapidly milled — in almost all cases difficult operations become a comparatively simple task.





## KEARNEY & TRECKER'S ROTARY HEAD MILLER

***The Most Versatile Machine Ever Designed for Mold and Die Work***

**DIRECT** . . . mills mold cavities in a single set-up without the aid of templets or models.

**ACCURATE** . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements — possible only with this machine — transmits mathematical precision to the work.

**FAST** . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

***Write for Bulletin No. 1002C for complete information on the Milwaukee Rotary-Head Miller and the accurate and rapid production of all types of molds and dies.***

Rotary Head Milling Machine
Autometric Jig Borers
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**Kearney & Trecker** *Products*
CORPORATION
Milwaukee, Wisconsin

Milwaukee Face Mill Grinder
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d-c process is used, especially in corners and at the ends of the joints, and makes it difficult for the operator to control the arc and molten pool. Next a series of scenes shows in detail how readily a-c welding lends itself to the use of larger electrodes and higher currents. A number of close-ups demonstrate the faster speed obtainable with the larger electrodes.

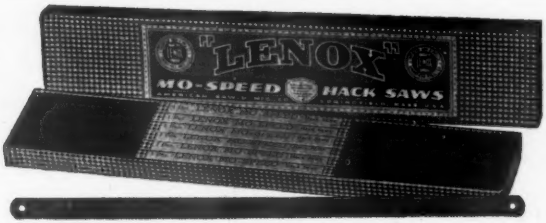
## Guam and Captured Nazi Invasion Films Ready

Two timely new combat films, "Return to Guam" and "Invasion—Nazi Version," are now available for exclusive showing to war workers, as announced by the Industrial Incentive Div., U. S. Navy.

The invasion films were captured from the Nazis in the swift-moving invasion onslaught of the Allies, and show the storming of the beaches as seen through the eyes of the Nazi cameras. Besides illustrating the high cost in men and materials exacted by the most gigantic invasion in history, the film shows scenes in which captured American and English paratroopers are being marched to prison camps behind German lines, and others depicting the savage duel of gunfire between Nazi shore batteries and Allied battlewagons off-shore, firing at almost point-blank range. Running time is 18 minutes.

"Return to Guam" is an exciting 16-minute resumé of the terrific assault which brought U. S. Forces back to the soil of Guam for the first time since Japan grabbed the former American possession. First is shown the 17-day "softening up" process—with all the Navy's guns from the big 16-inchers down to the small 40mm's and 20mm's, seen and heard throwing at the Japs some of the 11,000 tons of ammunition expended in that one bombardment. Climax of the film shows Marines "hitting the beach".

War plants and labor groups which have not already received approval for showing Navy films should write to the Industrial Incentive Div., Navy Dept., 2118 Massachusetts Ave., N. W., Washington 25, D. C. A nominal rental charge is made.

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Any size or style of blade in the Lenox line of metal cutting hack saws, band saws and high speed power blades is available from stock. Check your saw blade needs now.

We offer on request a free catalog illustrating the Lenox line and giving you time and money saving tips on standard sawing practice. Yours for the asking.

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# ILLINOIS DIE FILING MACHINE

**Reduce costs and improve quality with this TRIPLE-PURPOSE Machine**

**A versatile bench type machine for all three major production steps in the die-making process—sawing, filing and stoning. Quality built throughout to stand up longer and produce more accurate work. Forced-feed lubrication plus hardened and ground shafts running in bronze bushings combine to minimize wear and prolong life. Maintained accuracy is secured through holding chuck and clamping device which provide positive file alignment, and balanced moving parts which operate without vibration. *Write for descriptive literature.***

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*Manufacturers of Metal Cutting Tools and Shakeproof Products*

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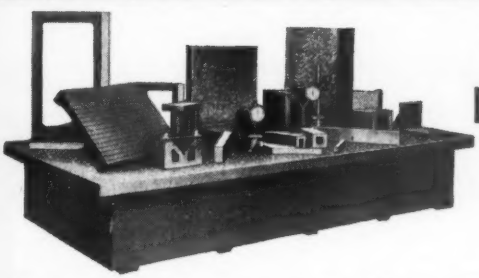

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## Recent U. S. Patents

Among recently issued U. S. Patents the following are of Tooling interest. If you are interested in studying any of these Patents, simply advise "Patent Information Service", The Tool & Die Journal, 2460 Fairmount Blvd., Cleveland 6, Ohio, enclosing 20 cents for each Patent desired and we will gladly forward your order to Washington.

QUENCHING OF METALS, No. 2,340,724.
QUENCHING OF METALS, No. 2,340,725.
QUENCHING OF METALS, No. 2,340,726.
TOOL FEEDING MECHANISM, No. 2,340,735.
HONING TOOL, No. 2,340,767.
METHOD AND APPARATUS FOR CASTIN DIAMOND STUDDED TOOLS, No. 2,340,785.
MACHINE TOOL FEEDING MECHANISM, No. 2,340,874. G
METHOD OF MAKING BEARINGS, No. 2,340,902
DRAWBENCH GRIPPER CARRIAGE, No. 2,340,949
CUTTING OR SAWING MACHINE, No. 2,340,953.
TRY SQUARE, No. 2,340,970.
MACHINE FOR GAUGING THE HELIX OF HELICAL TOOTHED GEAR WHEELS, No. 2,340,978.
APPARATUS FOR SHAPING TUBULAR BLANKS, No. 2,341,002.
GRINDING WHEEL FORM DRESSER, No. 2,341,022.
TOOL SUPPORTING AND EJECTING STRETCHER, No. 2,341,051.
LAPPING ARBOR, No. 2,341,094.
DIVIDING HEAD, No. 2,341,099.
PRECISION LOCATING TOOL, No. 2,341,107.
APPARATUS FOR SHAPING TUBING, No. 2,341,144.
RIVETING MACHINE No. 2,341,167.
METAL TUBING BENDING MACHINE, No. 2,341,178.
AIR EJECTOR FOR DIES, No. 2,341,187.
MILLING MACHINE, No. 2,341,194.
CONTOUR CUTTING MACHINE, No. 2,341,201.
SHEET METAL WORKING MACHINE, No. 2,341,215.
AUXILIARY ATTACHMENT FOR "KNEE TYPE" LATHE TOOLS, No. 2,341,277.
TIPPED CUTTING TOOL, No. 2,341,314.
PRECISION BORING MACHINE, No. 2,341,383.
DRILL JIG, No. 2,341,418.
POLISHING MACHINE, No. 2,341,442.
GAUGE FOR SETTING BORING BAR CUTTERS, No. 2,341,466.
COMBINED MACHINE FOR SURFACE GRINDING AND POLISHING GLASS AND OTHER MATERIALS, No. 2,341,524.
ABRADING APPARATUS, No. 2,341,559.
ABRADING APPARATUS, No. 2,341,560
DEVICE FOR METALLIZING, No. 2,341,603.
METHOD OF AND APPARATUS FOR MOLDING, No. 2,341,617.
LATHE ATTACHMENT, No. 2,341,619.
TOOLHOLDER, No. 2,341,659.
TOOL AND HOLDER THEREFOR, No. 2,341,660.
TOOL AND HOLDER THEREFOR, No. 2,341,661.
MEANS FOR DRAWING SHELLS, No. 2,341,667.
METHOD OF AND MACHINE FOR TURNING METAL AND THE LIKE, No. 2,341,668.
SCREW GAUGE, No. 2,341,679.
FEED COLLET, No. 2,341,744.
EXTRUSION DIE, No. 2,341,749.
LATHE DRIVE, No. 2,341,808.
INDICATOR, No. 2,341,809.
ART OF GRINDING, No. 2,341,820.
LATHE CHUCK, No. 2,341,926.
CHUCK, No. 2,341,947.
PUNCH, No. 2,341,976.
METHOD AND APPARATUS FOR BRIQUETTING OF POWDERED METAL, No. 2,341,732.
METHOD OF MAKING POROUS METAL, No. 2,341,739.
MACHINE TOOL DRIVE, No. 2,341,742.

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This famous "PUSH-OUT" type collet chuck insures GRIP, RIGIDITY, has AUTOMATIC ADJUSTMENT, and FULL POWER under all conditions. There are no fingers, cams or bearings to cause friction or heat. HALL'S COLLET CHUCKS give full spindle capacity or over.

**Now available in two sizes**

One inch maximum capacity . $ 95.00
Two inch maximum capacity . 145.00

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# DIECASTING DIGEST

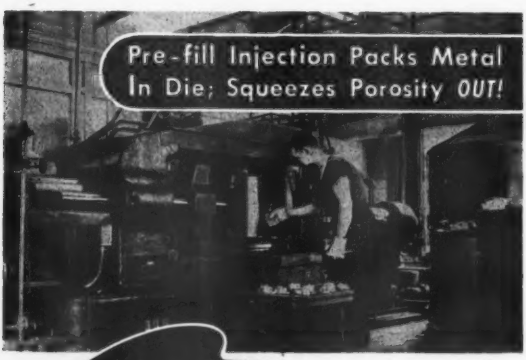
## III—Factors Controlling the Quality of Aluminum Die Castings

Physical characteristics of aluminum die castings are determined by (1) alloy constituents (2) casting procedure.

Principal defect in all castings is porosity, which may occur at stress locations and cause failure in service.

Porosity arises from (a) shrinkage voids and (b) entrapped air and gases. It may be controlled by design of the part and of the die with regard to flow to adjacent sections of varying thickness, and by proper gating and venting. Final injection pressure therefore has a definite influence on the quality of the casting. Injection pressures up to 33,000 psi are now available in Lester-Phoenix die casting machines.

Pressure can be applied to die castings, however, only to the extent that it can be confined to the die cavities, and this requires a rigid, non-elastic frame structure and a powerful, rigid mechanism for die closing and locking. The first is accomplished by means of the Lester beam-type frame, consisting of heavy "moly" cast steel beams, base and end castings in the form of a closed "U". The second is achieved by the Lester patented hydraulically-operated double toggle and link mechanism, providing a "die squeeze" of 150 to 600 tons.

*Lester-Phoenix HHP3X die casting machine with pre-fill system, in operation at National Cash Register Co., Dayton, Ohio*

▶ The aluminum-silicon aircraft carbureter parts shown here are cast on a pre-fill equipped Lester-Phoenix under 33,000 psi. *held upon the metal as it chills in the die.* Despite heavy sections which invite internal shrinkage, severe inspection rejects less than 2% of production. Tolerances are held to ± .006 from a flat plane.

Note the massive, beam-type frame and die-locking mechanism of the Lester-Phoenix machine, which confines injection pressures to the die cavity. Want the rest of the story? Write:

LESTER-PHOENIX, INC.
2625 Church Avenue, Cleveland 13, Ohio

LESTER-PHOENIX
DIE CASTING MACHINES


### MORE APPLICATIONS FOR DIE CASTING

The full story of "slow squeeze" injection is told in the IRON

AGE article, "Pre-fill Injection System for Die Casting". Reprints free. Lester-Phoenix, Inc., 2625 Church Avenue, Cleveland 13, Ohio.

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**CERROMATRIX** (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

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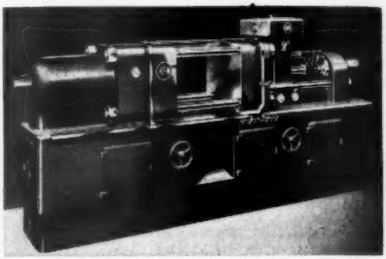
## "All-Hydraulic" Injection Molding Machine

Incorporating many new design features and representing one size of a new postwar line of "All-Hydraulic" injection molding machines, a new sixteen ounce machine for injection molding of thermoplastic materials is announced by the Hydraulic Press Manufacturing Company, Dept. D., Mt. Gilead, Ohio.

The straight-line hydraulic mold clamp



consists of a double-acting ram, fitted with metallic piston rings, working in a smooth bored steel cylinder. A small internal booster ram provides fast closing speed for the main ram. The movable die head, a solid steel forging, can be moved forward hydraulically. The stationary head is U-shaped, permitting unobstructed clearance for easy removal of heating chamber or nozzle.

The injection unit is also operated by hydraulic power. The injection chamber is designed with a new interrupted wedge locking device, permitting removal of the chamber by rotating it sixty degrees. The chamber employs a two zone electric band heater system with Wheelco indicating temperature controls. An aluminum cast material hopper is hinged at the base providing access to the feeder unit for cleaning.

The gravity type material feeding unit is hydraulically controlled. Sprues and gates from moldings can be fed directly into the feed chamber through a convenient opening. Machine operation is either manual or semi-automatic. Two radial pumps directly connected through a double end shaft motor provide controlled hydraulic power, one pump powers the mold clamp unit, the other the injection unit. Radial pumps, valves and controls are all H-P-M products.

*INFORM-A-GRAM KEY No. 328.5-P*

NEW AND REVOLUTIONARY

# MAGNETIC CHUCKS

FOR

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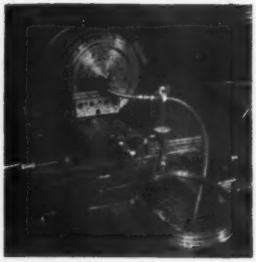

Following the arrows will quickly show how you may utilize the new Magnetic Circuit of our POWER-GRIP Chuck. The combinations of blocking, shimming, etc., are only limited by the operator's experience and imagination. The holding power lost through the various blocks is negligible.

On a 10" cast iron ring, in Detroit—"We are pleased to say this has meant a 300% increase in production and a 5% decrease in scrap to this item."

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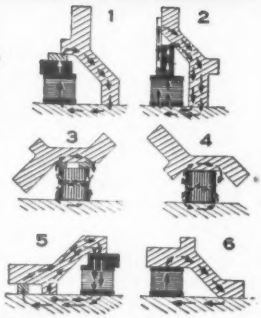
(Signed) W. JACKSON,
Factory Manager.

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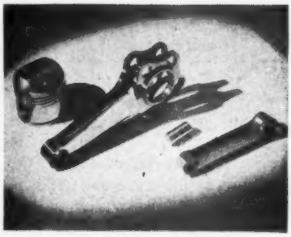

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***Twenty times the speed of a previous operation in cylinder dome polishing . . . at least a six-fold time saving in finishing link rods***

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Your dealer has Brightboy—and service information. Brightboy dealer representatives and service men will be glad to work with you on your production problems.

*Left: Brightboy-polished cylinder dome; Right: dome before polishing.*

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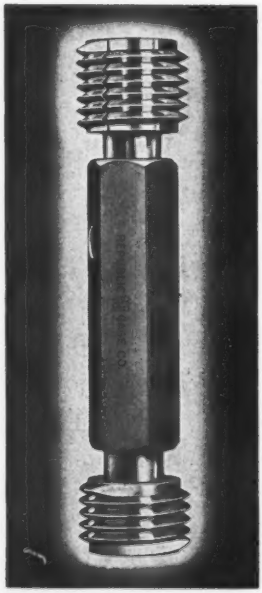

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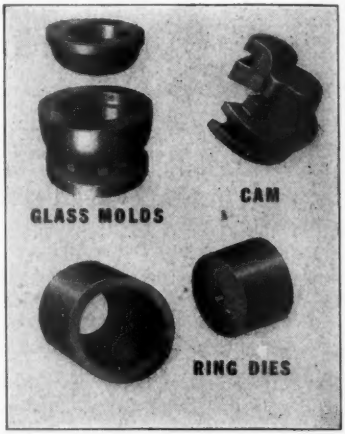
## Jessop Cast-to-Shape Tool Steel Applications

Tool steels are now being cast-to-shape for commercial applications by the Cast-to-Shape Division of Jessop Steel Co., Dept. TDJ, Washington, Pa., which has recently been expanded by the addition of up-to-date equipment for the production of special steel castings. Jessop Tool Steels Cast-to-Shape are used for dies, forming tools, glass molds, gages, hobs, gears, cams and numerous other items. The savings of time, labor, material, and machining costs that result are




most noticeable in the case of tool steel dies needed for immediate production, for the die is cast to the shape in which it will be used and requires only a minimum of machine finishing. All castings are furnished in the annealed condition to facilitate machining.

Standard types of tool steel castings are regularly being made, with the latest types of casting equipment, of air hardening, oil hardening, flame hardening, stainless and heat resistant anlyses. Many other analyses of specialty steels are available and the user's "tailor-made" specifications may be cast to shape. The heaviest sections are cored out and reinforcing ribs are used for added strength. Literature will be sent on request.

*INFORM-A-GRAM KEY No. 259-P*

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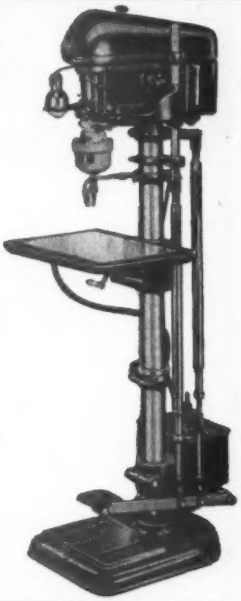

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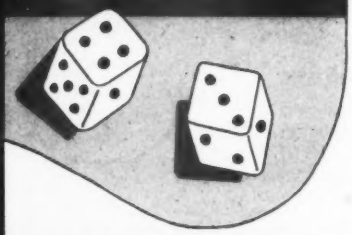

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When any machine goes "Down for Repairs" your production "Jams Up." To get that machine running again may cost only a few hours delay, but—the production lost can mean thousands of dollars.

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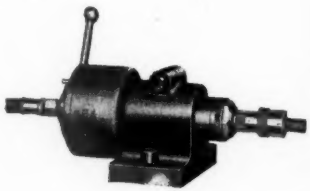
## "Whirlwind" Pneumatic Grinder

Of pleasing design, the Model W-SR stationary grinder has been engineered by M-B Products, Dept. DJ, 130 E. Larned St., Detroit, Mich., to fill a broad field where a fast and compact bench unit can be used most advantageously. In the case of a stationary spindle setup much time can be saved by taking the work to the grinder as compared to a portable spindle machine where the grinder is taken to, and manipulated around, the work.



The spindle of the "Whirlwind" is fitted with a ½" diameter hole permitting the use of a standard ½" diameter abrasive stick which allows getting into small places, and its speed of 55,000 rpm gives ample speed for excellent grinding without excessive abrasive wear. The end of the stick can be dressed to any desired shape. Where a cone shape is used, it is ideal for the burring of small holes or similar operations. The unit has three stages of power, attainable by three individual air jets controlled by a valve so that one, two or three jets may be employed. For all normal work one jet is sufficient, but if a tough job arises that requires more power, the operator can throw in the second or the third jet.

Because the oil can method of lubrication is most uncertain, in designing the "Whirlwind" grinder no provision is made for it, but to give the unit 96 to 97 percent protection from water, dirt and scale in air lines and to afford definite lubrication at all times, there is furnished with each unit a ¼" pipe size M-B Air Line Filter and Automatic Lubricator. The "Whirlwind" may also be used most advantageously for various types of lapping. Additional illustrated information can be obtained by using *INFORM-A-GRAM KEY No. A86-P*

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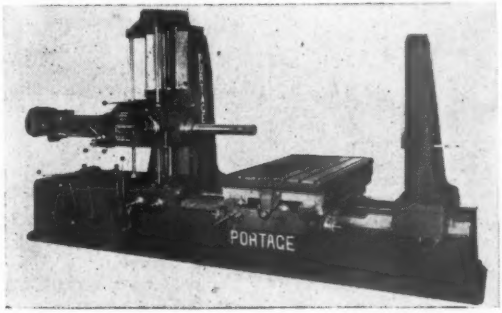


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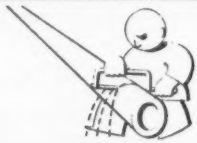

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*When you bore a solid bar of tool steel to make a tubular part . . .*

*you get two things: the part itself . . .*

*and a pile of scrap . . .*

*and you waste time, manpower, money and metal in the boring process.*

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*But when you make your part out of* **BISCO** *tool steel tubing . . .*

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*SO—*

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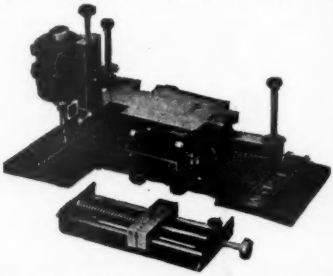

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## Die Supply Co.—Lenox Saws

Die Supply Co., Dept. TJ, 4751 Hough Ave., Cleveland 3, Ohio, have just announced their recent appointment as exclusive distributors in the Cleveland territory of the complete Lenox line of metal cutting Hack Saws and Band Saws. Any size or style of Lenox saw blade can be ordered for immediate delivery from Die Supply's stock. Their useful catalog also gives time and money saving tips on standard sawing practices.

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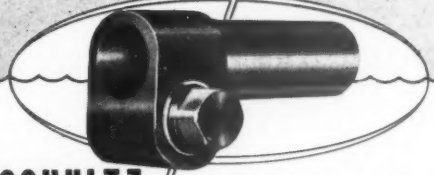

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ANOTHER quality Tool by Boyar-Schultz, built to become a permanent part of screw machine equipment.

This Model H Precision Adapter increases the flexibility of screw machines, permitting the use of more than one size tool in a screw machine of a single size.

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Burke motor driven milling machines Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

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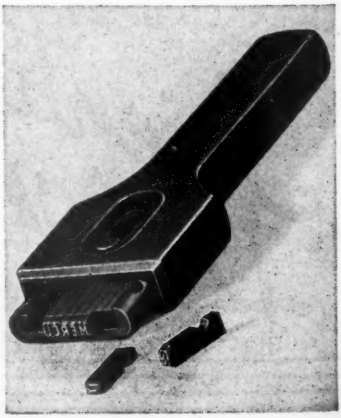
**301 E. 16th St. -:- Conneaut, Ohio**


## Mercury Type Holder Speeds Marking Jobs

An interchangeable type holder of simplified construction has been developed by Mercury Metal Die and Letter Co., Dept. TJ, 546 E. 16th St., Los Angeles 15, Cal.

The new Mercury Interchangeable Type Holder speeds part marking operations by enabling the user to stamp an entire number with a single hammer blow. In the mass production for aircraft, etc., this feature saves valuable time on part numbering and eliminates the usual errors such as wrong sequence, overlapping, gouging of metal and other problems encountered when using single-character stamps. The holder is so constructed that type cannot be placed in it upside down, and all type is rigidly held in alignment. It consists of three simple parts, body, anvil and release button. The anvil, containing the type, is slidably connected to the body so that it can be opened and closed by simply pressing a release button. All parts are of machined steel construction and amply rugged to withstand continuous use. The holder is compact, permitting accurate, legible marking in more restricted areas than can normally be achieved when using single character punches. The Mercury Interchangeable Type Holder is available with hardened and ground steel type, in four standard sizes and can also be had with shank to fit hand, arbor or kick presses.

*INFORM-A-GRAM KEY No. 657-P*



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A reliable precision indicator especially designed for rapid, convenient and accurate measurement of internal diameters. Variations of as little as 0.00005" in size, out of round, and taper of bores can be quickly determined. Hundreds are in daily use on production lines and in inspection departments on innumerable applications where close limits on size, roundness and straightness of bore are of prime importance.

It can be set to any required size direct from Johansson Gage Blocks or Master Ring.

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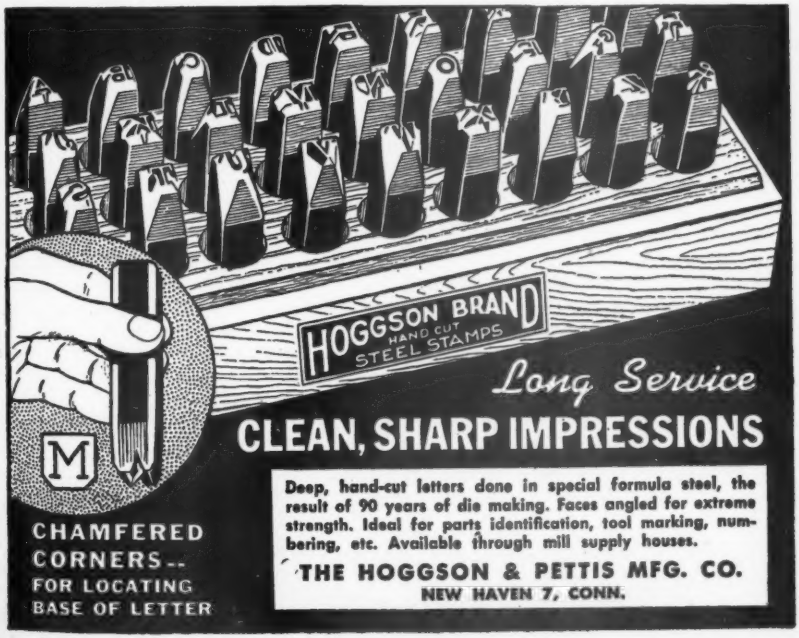


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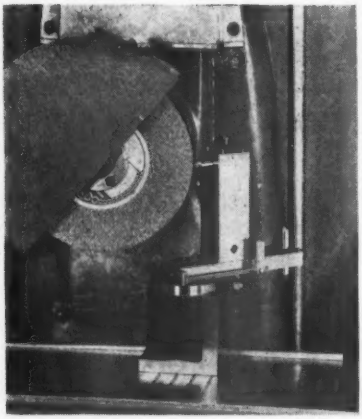
CHAMFERED CORNERS -- FOR LOCATING BASE OF LETTER

Deep, hand-cut letters done in special formula steel, the result of 90 years of die making. Faces angled for extreme strength. Ideal for parts identification, tool marking, numbering, etc. Available through mill supply houses.

**THE HOGGSON & PETTIS MFG. CO.**
NEW HAVEN 7, CONN.

# The FORM-MASTER

## ANGLE AND RADIUS DRESSER



An all-purpose angle and radius dresser for high-precision at low cost. Accurate easily within .001". Simple to operate. Dresses in vertical position enabling operator to SEE the form in work. All parts hardened and ground (except cast-iron base which can be drilled and tapped). Suitable for surface and cylindrical grinders. Two 1/3 ct. quality diamonds and instrument case included . . . $150.00.

It readily produces: Any desired angle; Convex radii to 4"; Concave radii to 7". On 7" wheel.

Specifications: Base 3"x 3", Height 8½"; Wheel capacity 10"; Angular travel 3".

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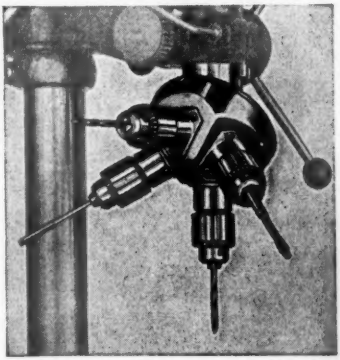
• PRECISION DRESSING TOOLS •


## Drill Press Turret Attachment

Introduced by the name QUADRILL is a new attachment for drill presses that is designed to increase the capacity and flexibility of any drill press by four times. It is offered by the Chicago Drillet Corp., Dept. TD., 919 N. Michigan Ave., Chicago 11, Ill. The new unit is a precision built, rotary turret holding four tools. By a simple and quick indexing of the turret the desired tool can be brought to its position for any drill press work such as drilling, counter-boring, reaming, center-drilling, counter-sinking or spot facing, thus permitting one drill press to do the work of four. Only the drill in working position rotates while



the other three remain stationary for safety purposes. The entire unit is secured to the drill press quill and the drive is from the spindle. Because of its construction and method of mounting, accuracy of alignment equal to that of the drill press is assured. Friction starting and driving mechanisms result in proper synchronization of the driver teeth. The four hardened and ground spindles are fitted for No. 32 Jacobs chucks or equivalent. Ball bearings are used in all spindle assemblies. Use of our Inform-A-Gram Key No. B34-P will bring complete details and prices.
*INFORM-A-GRAM KEY No. B34-P*

★

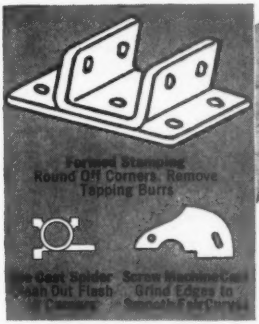
The First Annual Meeting of The Magnesium Association will be held on October 3 and 4 in New York at the Waldorf-Astoria Hotel. Perry D. Helser, Secretary-Director, 30 Rockefeller Plaza, New York, can give details.

# 18 WAYS TO SAVE TIME & MONEY *with the* MEAD *Industrial Burring Machine*

New circular explains, illustrates 18 ways in which the Mead Industrial Burring Machine saves time and money—also contains special Grit Guide. Every industrial plant needs this "Jack-Of-All-Trades" machine. Your burring can be done in "free time"—install these machines by every machine tool which leaves burrs. Grinds, finishes both outside and inside cut-out openings. Immediate delivery in most cases. Write for the informative Money-Saving circular now.

◆

**MEAD**
**Specialties Co.**
15 S. Market, Dept. 94-H
CHICAGO 6, ILL.

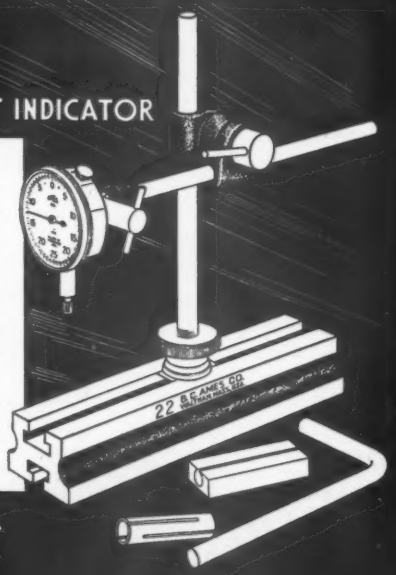


For METAL - PLASTIC - WOOD

# AMES No. 22. DIAL TEST INDICATOR

An ideal testing outfit for machinists, tool-makers, inspectors, scrapers and assemblers. Handy for determining the flatness of surfaces, roundness and trueness of revolving parts, relative heights and thicknesses, etc. Adjustable to any position, nicely proportioned for easy handling, sturdily built to support the Indicator rigidly, and nicely finished.

Packed in deluxe wooden box. Other models shown in our catalog. Send for a copy.




B. C. AMES CO.
WALTHAM, MASS., U.S.A.

# TIME YOU DISCOVER STRENES METAL

● This is no idle suggestion for engineers in many lines have tried and adopted Strenes Metal — are regularly specifying it wherever possible.

*Builders of automobiles, trucks, tractors, farm implements; refrigerator, stove, metal furniture manufacturers; designers of fans, blowers, bicycles; almost anything involving drawing and forming operations.*

They are able to have Strenes Metal cast to shape — usually to 1/16", saving 50% to 75% of the time ordinarily required to machine off excessive stock. They are obliged to redress their dies about ⅓ as frequently as usual. Runs of 1,000,000 deep drawn parts are not unusual.

That is just part of the Strenes story. Why not get the rest of it? Isn't it high time you also "discover" Strenes Metal for drawing and forming dies?

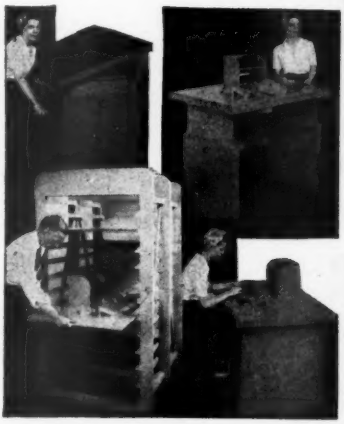
**THE ADVANCE FOUNDRY CO.,**

Dayton 3, Ohio

Strenes METAL


## Rightop Work and Inspection Table

National distribution of the new Rightop Work Table is announced by the Voss Machinery Co., Dept. TD, 2856-C West Liberty, Dormont, Pittsburgh 16, Pa. The Rightop Work Table both raises and tilts and has interchangeable tops. Combined with the work holding rack feature it enables the keeping of up to 12 jobs "on the board" at one time. A product of the Methods Development & Equipment Company, this new type of work table has been engineered to conform to the basic principles of motion economy and it is quickly adjustable to fit the worker and the job. A foot rest is provided. The table top may be tilted from a level position to either 15° or 20°. On certain jobs this reduces the reaching distance, thus saving time and effort. A table top holding rack is available which holds up to six table tops depending upon the height of the attachments on each top. In a plant doing miscellaneous work, one work table and one rack of table tops is the equivalent of up to seven workbenches of the conventional type. The interchange of table tops permits the use of engineered workplace layouts on all types of light and fast assembly and inspection work. Our Inform-A-Gram Key No. B51-P will bring information on many ways of saving time, energy and costs.

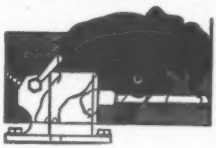


*INFORM-A-GRAM KEY No. B51-P*

*Announcing*

# MEAD AIR COLLET FIXTURES

These new high production precision fixtures open up new vistas in the field of second operation work. Their accuracy will meet the most rigid requirements; their fast action leaves nothing to be desired; their compactness does not waste a fractional inch. They will hold a 1" bar so firmly that a strong man cannot turn it with a 12" pipe wrench, yet in conjunction with a suitable pressure reducer they will gently handle the most delicate of precision parts as low as $\frac{1}{16}$" in diameter. Automatic ejection of finished work.

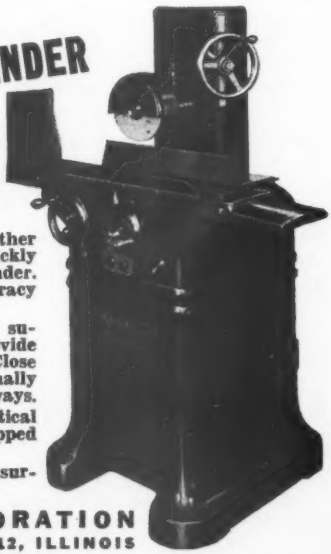


**MEAD SPECIALTIES COMPANY**
15 So. Market St., Dept. 94-HA, Chicago 6, U.S.A.

*Write for new Mead Air Power Catalog*

# BOYAR-SCHULTZ NEW 618 SURFACE GRINDER

TOOL ROOM PRECISION



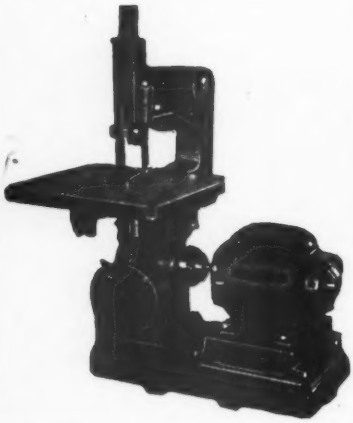
Gage grinding, tool and die work and any other work requiring close precision grinding is quickly accomplished with this sturdy Surface Grinder. It is built to maintain a high degree of accuracy through long continuous use.

Dynamically balanced spindle equipped with super-precision, pre-loaded ball bearings provide smooth and quiet operation at 3,000 R. P. M. Close grained Meehanite table moves longitudinally only, and on hardened and ground tool steel ways.

Cross feed is provided by support of the vertical column on horizontal tubular steel ways, lapped and ground to fit.

Wheel moves in true plane across the work assuring long continuous accuracy.

**BOYAR-SCHULTZ CORPORATION**
2112 WALNUT STREET CHICAGO 12, ILLINOIS



**OLIVER**
**DIE MAKING MACHINES**

THE basic needs of faster, smoother sawing and filing are met with the Oliver Die Making Machines. Operating efficiency is increased 50 to 60 per cent over hand methods in the making of precision dies, gages, cams, templates and similar products requiring rapid and accurate filing, sawing and lapping operations.

*Send for literature describing the line of Oliver Die Making Machines!*

●

**OLIVER INSTRUMENT COMPANY**
1436 Maumee St., E. - Adrian, Mich.

*We also build Drill Grinders, Tool and Cutter Grinders, Face Mill Grinders, Template Tool Bit Grinders.*

## Wage Incentives Survey

A recent report of the War Production Board reveals that application of the wage-incentive principle of "more work, more pay," has solved manpower and production problems in a number of foundry and forge shops.

The report was based on a survey of wage-incentive plans of various types being tested in 86 foundry and forge shops, and showed that in 20 of these plants, production increased 42% through offering more pay for increased effort.

These findings, as reported by WPB's Management Consultant Division, indicated that if all the plants show the same production gain as the 20 for which figures are complete, the effect of the wage-incentive plans would be equivalent to adding 7,000 men to the labor force in the 86 plants.

The survey indicates that approximately 17,000 workers have increased their earnings 18% through the wage incentive plans, while at the same time the foundries and forge shops have reduced unit labor costs by 12%.

Cooperative effort of management and labor was responsible for the incentives applied in 61.4% of the 86 plants where workers were affiliated either with the AFL or CIO. Of the remainder, 8% represents joint action by management and independent union, while in 30.6% of the cases no union was involved.

Of the various wage-incentive plans being tested, 30% are based on individual performance, 50% are based on group performance, and plant-wide performance is the yardstick in 16.3% of the cases. The balance of 3% represents plans where production is measured on the basis of both performance by individuals and by groups.

Past performance is the most widely used measurement on which the standards of production are set. 67.5% of the cases fall into this classification, while in 26% the standards are set by time studies, with the remainder of 6.5% based on a combination of time studies and past performance figures. The WPB survey shows that, over a 90-day period, production gains took place in 20 plants located in the following five regions: New York, 47.6%; Boston, 22.5%; Chicago, 47.5%; San Francisco, 45.3%; Detroit, 45.3%.

# C-F POSITIONERS

*Handle the*

## BIG JOBS

*Easily and Safely*

With C-F Positioners each welder can position even the most cumbersome weldments with a push button control—without crane work or handling crews. He can rotate the weldment a full 360°, rotate it at any speed from 0 rpm up and can tilt it to 135° beyond horizontal . . . can weld all sides, surfaces and angles down-hand with a single set-up; with larger rods and fewer passes. All C-F Positioners, both stationary and portable, are pedestal mounted to give maximum floor and working clearance; all are adjustable for height.

Write for Bulletin WP-22

**Cullen-Friestedt Co.**
1316 S. Kilbourn Ave.
Chicago 23, Ill.

# "STAR DUST"

LABORATORY GRADED
PURE DIAMOND POWDERS

## Precision LAPPING POWDERS

## for PRECISION work

GAUGES, TOOLS, DIES, etc. with tremendous TIME SAVING

The following factors have made STAR DUST indispensable in lapping and superfinishing operations on HARD STEELS, TUNGSTEN CARBIDE, CHROME.

- Absolute control of particle sizes
- Complete absence of out-size particles
- STAR DUST sizes as fine as .0001"
- Complete range of grit sizes

*Consult us about your lapping and super-finishing problems.*

STAR DUST speeds up production enormously and produces finishes and superfinishes down to less than .0000004 of an inch.

**ACE ABRASIVE LABORATORIES**

ONE SPRUCE STREET
NEW YORK 7, N. Y.

IMMEDIATE DELIVERY
FROM STOCK
On Standard Sizes

HIGH SPEED—PRECISION
CENTER
DRILLS

*Attention!*

ALL SCREW MACHINE HOUSES

Here is just what you have been looking for. A High Speed, accurate Center Drill that guarantees a perfect center every time.

No longer is it necessary for you to cut down one of your drills for centering purposes. These tools are designed to give long and dependable performance.

SINGLE END—RIGHT AND
LEFT HAND AVAILABLE

★

*Satisfaction assured on a complete stock of all types of standard cutting tools and end mills.*

Prompt Delivery on Special Tools, Dies, Jigs and Fixtures Made to Your Exacting Requirements

★

Write for prices on standard sizes or submit blueprints for special sizes

Galter Manufacturing Co.
711 W. Lake Street - Chicago, Ill.

## WPB Permission Unnecessary for Production of Unrated Capital Equipment Orders.

Producers of capital equipment, including machine tools, precision measuring and testing instruments, electric motors and generators, and other general industrial equipment, need no longer obtain War Production Board permission to begin production on unrated purchase orders for such equipment, placed under Priorities Regulation No. 24, WPB announced August 29th. (WPB 6366 Cleveland No. 375.)

This action has been taken to simplify the procedure which must be followed by capital equipment manufacturers in accepting purchase orders for items which will be needed to bring about an early resumption of civilian goods production.

This change, which is contained in PR 24, as amended August 28, 1944, does not affect the provision of the regulation that requires purchasers of machine tools and other equipment to obtain specific WPB approval before they place an unrated purchase order. Persons desiring to place unrated purchase orders for the items covered by List A of PR 24 will continue to apply for approval to do so by filing a letter in triplicate with their nearest WPB field office, giving a description of the equipment, including make, type, size and approximate price. Approval for placing such unrated purchase orders will be given on Form GA-1977 by WPB if no suitable existing equipment is found to be available.

★

## Peninsular Steel Offers Graphitic Steel Catalog No.8

The Peninsular Steel Company, Dept. TD, 2222 Lakeside Ave., Cleveland, Ohio, announces the new 8th revised and enlarged edition of the illustrated 48-page Timken Graphitic Steel Booklet. It's full of good technical know-how on the five Graphitic steels: Graph-Al, Graph-M.N.S., Graph-Mo, Graph-Sil and Graph-Tung. Request direct or use convenient *INFORM-A-GRAM KEY No. 760-P*

# Grobet

## ROTARY FILES

**HAND CUT — MILLED CUT**
**GROUND FROM THE SOLID**

There is a Grobet Rotary File, Cutter, Diesinker's Bur in shape, size, and coarseness of cut for every type of hard or soft metal, plastic, wood, etc.
Send for Catalog Y. R. illustrating the complete line in full size, speed charts, etc.

**GROBET FILE CO. of AMERICA**

**421 Canal Street** — 1812 F. L. GROBET — **New York 13, N. Y.**

IMPORTERS OF GROBET SWISS FILES — MFRS. OF GROBET ROTARY FILES

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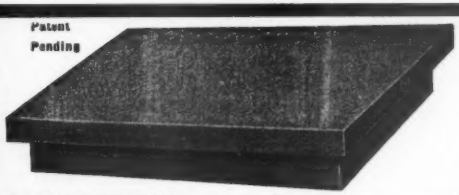


NATION'S LEADING MANUFACTURERS OF QUALITY PRODUCTS USE

## "HERMAN" PRECISION GRANITE SURFACE PLATES

The reputation for quality, accuracy and indestructibility established by "HERMAN" Precision Granite Surface Plates has made them first choice — over ordinary plates — of the nation's leading industries engaged in important war work. Accurate to .0001 of an inch, non-magnetic and warp-proof, "HERMAN" Precision Granite Surface Plates meet every exacting requirement of all tool-room, production and inspection operations — to step up plant efficiency and economy. Improve your standards of quality control . . . save time and money . . . with "HERMAN" Precision Granite Surface Plates. Available in many sizes at reasonable prices.

A Few of Many Well-Known Users of "HERMAN" Precision Granite Surface Plates

U. S. Bureau of Standards
General Motors - Chrysler
Ford - General Electric
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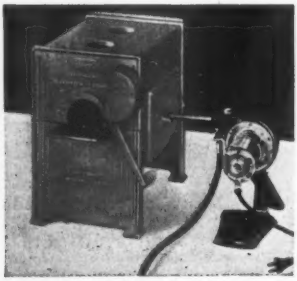
Allis-Chalmers
International Harvester
Curtiss-Wright - Crosley Radio
Bendix - Bausch & Lomb

## The Herman Stone Co.

1243 LEONHARD STREET, DAYTON 4, OHIO

THE "Stark"
ELECTROBLAST
*Fast, efficient heat!*



High Speed
Muffle Furnace

**Will your furnace heat to 2350° in 20 minutes? Will it operate for 7c per hour? Does it scale your work?**

**"ELECTROBLAST" will save time, fuel and rejected work. It requires no compressor or piping. Heats work indirectly. Muffle dimensions 7 x 3⅛ x 2⅛". Price $70 as shown. Also a larger furnace 7 x 4⅝ x 3½".**

**STARK TOOL COMPANY**
**Established 1862**
**Waltham, Massachusetts**
***Originators of the American Bench Lathe***

## Plastics Sandwiches

*(CONTINUED FROM PAGE 142)*

The plastics sandwich was made up from a high tensile surface material and a resin impregnated wood pulp core. By a selection of material for the outer plies and resin and filler for the core varying properties of strength, weight and density can be built into the laminate. The material can be easily molded to irregular shapes. When required special high density areas can be provided for special stresses such as the attachment of fittings without sacrificing lightness or strength. Structural as well as non-structural applications for the new material are now in the experimental stage.

The core consisting of two sheets of resin impregnated woodpulp is sandwiched between built-up plies of resin-impregnated facing paper in a box-like jig. The assembly is stapled together to facilitate handling. The assembly is then placed in a kirksite die shaped to provide the required radius. A flat pressure plate is then placed over the assembly as a cover and the loaded die is placed in a hydraulic press equipped with electrically heated platens. Heated to a temperature of about 300° F, the resin in the composite or laminated material flows as a pressure of 5 to 10 pounds is applied. Each molded mounting plate is cured in the press while the next assembly is being constructed.

Subsequent machining operations are similar to those required from parts made of phenolic fibre plate. The rectangular sheets are placed in a router board and cut to the desired shape. The edges are sanded and attaching and locating holes are drilled in a jig. Holes of various sizes are fly cut on the inner surface of the plates to allow passage of the antenna wiring.

Martin composite plastics are procurable in specific gravities ranging from that of spruce, (.443, Sitka, 15% moisture content) and poplar wood (.449, Yellow, 15% moisture content) to that of laminated phenolic plate (1.3-1.4 for paper or fabric base) which is about half the weight of aluminum. In addition to impregnated paper other materials including aluminum alloy, phenolic sheet, fibreglas and fabric have been successfully employed for the face plies.

# BAKER

**Model 314A**
**Universal Quick Change Type**
**Heavy Duty Drill**

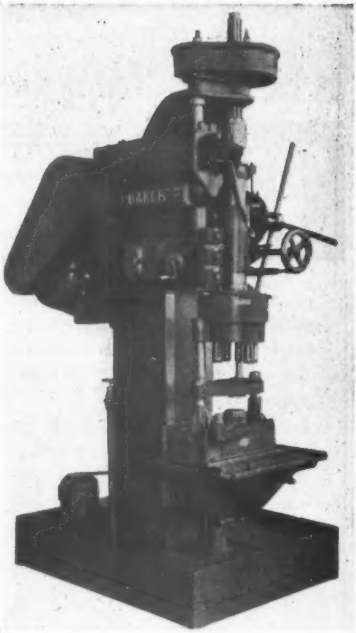
**Single spindle machine equipped with flanged quill spindle construction for better adaptation of multiple head. Change-over flexibility. Quick change speed and feed. Reversing controller allows tapping.**

**Two piece vertical frame with complete assembled unit on upper frame allows use of spacer blocks for increasing spindle-table clearance. Multiple splined spindle top drive; multi-vee belt drive. Ample capacity to drive 3" HS twist drills.**

**This type of machine offered in various sizes.**

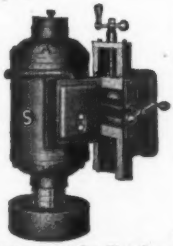
*Circular No. 1000X on request*

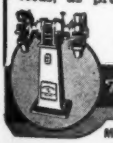
## BAKER BROS.
**Toledo 10, Ohio**



"RIGHT! YOUR MACHINE TOOL CAN NOW SERVE YOU AS A (STANDARD) GRINDER TOO."

**YES SIR!** You can now make your machine a "double purpose" machine, the "Standard Way". STANDARD VERTICAL SPINDLE GRINDERS can be easily mounted on your Planers, Boring Mills, Shapers, Milling Machines, etc., giving you added profits! Available with or without feeds, as preferred.





Write for Your copy of Catalog 43, today.

The STANDARD ELECTRICAL TOOL Co.
CINCINNATI · 4 · OHIO
Mt. Hope & Sixth St.

DURABLE ACCURATE

## WIRE AND SHEET METAL GAGES

McGrath St. Paul wire and sheet metal gages are hardened steel with black finish, and held to within a tolerance of 3/10,000 inches. Gage numbers and decimal equivalents are clearly stamped.

*American Wire Gage*, standard for non-ferrous metals.
*Birmingham Wire Gage*, for iron wire, hot and cold rolled steel and sheet metal.
*U. S. Standard Gage*, for sheet and plate iron. (also comes in rectangular shape)

*Write for the new McGrath St. Paul Tool catalog illustrating Vernier Calipers, Height Gages, Micrometers, etc. Address Room 39.*

**McGRATH ST. PAUL CO.**
5th and Wacouta Sts. St. Paul 1, Minnesota

Reg. U.S. HY-PRO Pat. Off.

# TAPS

These high production taps produce consistently more accurately threaded pieces to lower the cost of your tapping operations.

Precision ground from the hardened solid of high speed steel, HY-PRO tap tolerances are held to extremely close limits. *Accurate tapping assures tighter, stronger fastenings that defy vibration!* Specify HY-PRO for High Production.

Commercial and Precision Ground Thread Taps

•

Special Ground Thread Taps

*Write for Catalog on Company Letterhead*

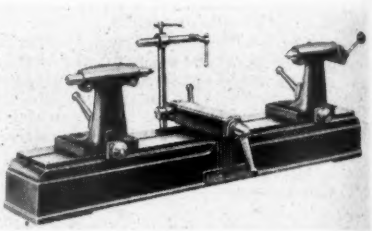
**HY-PRO TOOL CO.**

New Bedford, Mass., U.S.A.

489 Mt. Pleasant St. BUY BONDS

## Delta-Milwaukee Bench Center

Delta Manufacturing Co. has announced a new Delta-Milwaukee Bench Center. This new unit, combining the latest developments for accuracy and convenience makes possible the installation of a number of units so that inspection work may be speeded up.



The new Delta-Milwaukee Bench Center offers unique advantages in the design, construction, and operation of the indicator support bracket. This bracket has been termed "truly universal" and has a base that can be firmly and quickly locked in any position on the bed by merely operating a handle at the front. The part that holds the indicator can be placed in any position—vertical or horizontal. Large, convenient, clamp handles are provided making it unnecessary for the operator to use pliers or wrench.

The Bench Center bed is a heavy casting, fully normalized to relieve strain. Another distinctive feature of this unit is that the top surface is flat and the head and tail stocks can be reversed so that the unit may be operated from either side, adding to its convenience and flexibility. The interchangeable feature of the head and tail stocks results from the fact that they are identical castings, precision bored to make alignment in any position true and accurate. Both contain hardened and ground 60° angle centers.

The new Delta-Milwaukee Bench Center has a maximum distance between centers of 19½". The over-all length of the bed is 32", the width 5½". The dimensions of the ground bed are 4½" x 30". For illustrated literature use our *INFORM-A-GRAM KEY No. 51-P*

## CRITERION *Boring Heads*

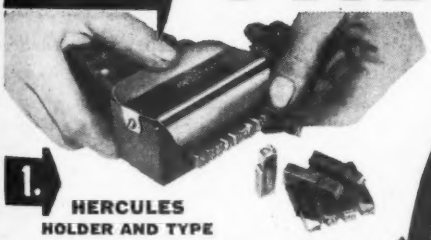
# Original Accuracy *Maintained*

Noted for maintaining original accuracy over a longer period Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

Lead Screw ground from solid AFTER hardening.

**CRITERION MACHINE WORKS**
BEVERLY HILLS, CALIFORNIA

# 3 WAYS TO MARK *FAST!*



1. HERCULES HOLDER AND TYPE

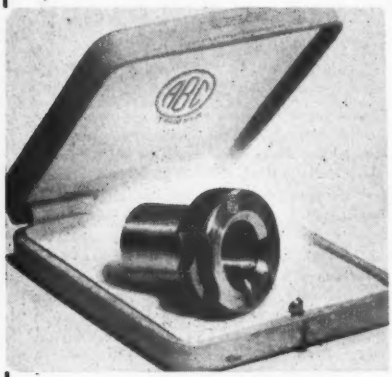
2. ACROMARKER STAMPING MACHINE FOR MARKING INSTRUCTION PLATES, DIALS, SCALES, PARTS etc.

3. STEEL LETTER AND FIGURE STAMPS

WRITE FOR PRICES AND COMPLETE ILLUSTRATIVE LITERATURE.

**THE ACROMARK COMPANY**
5-15 MORRELL ST., ELIZABETH, NEW JERSEY

JEWELS OF PRECISION



A. S. A. STANDARD DRILL JIG

BUSHINGS

*Prompt Delivery from Stock*

- HEADLESS PRESS FIT
- HEAD PRESS FIT
- FIXED RENEWABLE
- SLIP RENEWABLE
- HEADLESS LINERS

*also*

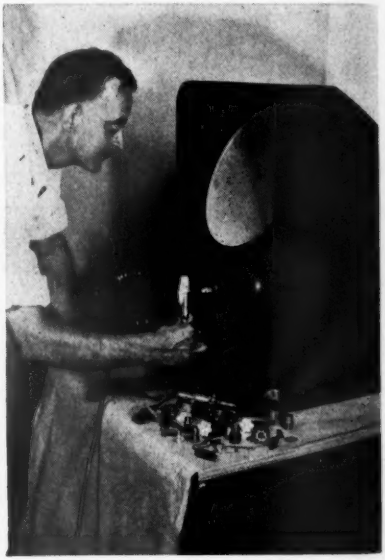
SCREWS • CLAMPS
LOCATING JIGS

*Send for New Catalog No. 243*

ACCURATE BUSHING COMPANY
447 NORTH AVE., GARWOOD, N. J.

## New Portman Bench Projector

The Portman Optical Company, Dept. J, 70 Mill Rd., New Rochelle, N. Y., has developed a new bench type optical projector incorporating several new features. This new Portman projector is very rugged and the design provides simplicity of operation and setup. The optical system consists of the finest optical components combined with a scientifically correct light source thus providing excellent screen image definition at all magnifications. Production speed of inspection is attained by using commonplace staging "V" blocks or other inexpensive holding fixtures generally on hand in inspection departments.



The new Portman Bench Model P2.5 Optical Projector has a large working capacity and is furnished with a standard full size 14½" diameter working screen. Stage area of the projector measures 4" x 4", the overall length is 42", width 18" and height 32". The projector can be furnished with a choice of a 10×, 25×, 50× or 90× magnification lens unit and may be operated on ordinary light circuits of 110 volts.

*INFORM-A-GRAM KEY No. 428-P*

# The WIGGLER has had its day!

There was a time when the wiggler was considered "tops" for positioning a machine tool spindle. BUT, THAT'S NOT TRUE ANY MORE.

The Center Scope is now the fastest method for accurate centering of a machine tool spindle. It has a trimming screw to compensate for spindle run-out, which European-made microscopes do not have. 45X magnification makes it easy to work to tenths.

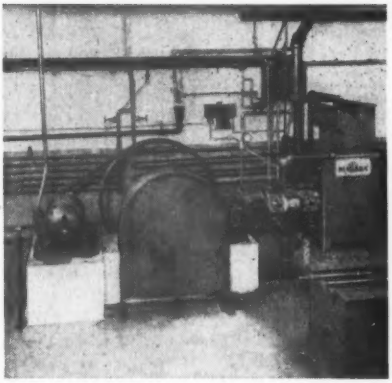
As a top-flight mechanic, you should own a Center Scope — or, if you feel that the boss should buy one, *put the bee on him.*

Center Scope with Illuminator and Eye Shield.....$97.00
f.o.b. Milwaukee

Edge Block for use with Center Scope .....$23.00

For complete details, write Dept. CS (3)

Kearney & Trecker Products Corporation
MILWAUKEE 14, WISCONSIN



# PROTECT YOUR AIR TOOLS

● The moisture that is condensed from compressed air is the chief source of trouble with air lines, tools and equipment. It may freeze in the lines; it may rust or damage products exposed to the air stream; it washes the lubricants out of your tools and causes rusting and more rapid wearing out of parts, especially in rotary tools.

To protect this equipment, take the excess moisture out of compressed air by using the NIAGARA AERO AFTER COOLER. It produces lower compressed air temperatures and the resulting air contains only one-half to three-fourths as much moisture as air cooled by conventional methods. Because it is an evaporative cooler, it uses atmospheric air as the cooling medium and pays for itself by saving water costs.

For complete information, write to

**NIAGARA BLOWER CO.**
30 Years of Service in Air Engineering
Dept. TD-94, 6 E. 45th St., New York 17, N.Y.
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AIR ENGINEERING EQUIPMENT

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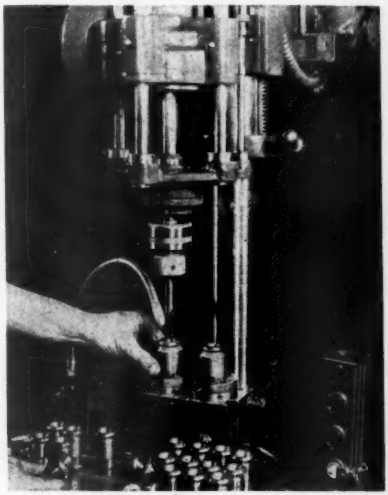
Write for catalog and essential information for sprocket users.

CULLMAN
WHEEL COMPANY
1332 Altgeld St., Chicago 14, Illinois

## Precision Tapping Fixture

A simple, new non-locking slide type fixture that utilized manual positioning and eliminates chucks or clamps to speed up precision tapping of ordnance parts has been very successful at Manufacturers' Machine Service Company, Detroit. This fixture, built to operate on a "Detroit" light duty lead screw type tapping machine (Detroit Tap & Tool



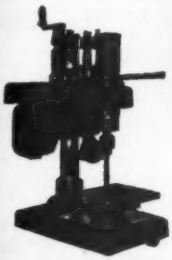
Co., 8432 Butler, Detroit 11, Mich.), permits tapping on a continuous basis.

The part required the tapping of a ¾", 16 NF thread 1¼" deep in a blind hole in 1112 steel for a class 3 mating fit.

The slide fixture, arranged to operate on an automatic tap and return stroke cycle stopping at the top, incorporates two non-locking work holders arranged on a slide that can be moved "right" or "left" on ground ways below the tap. Adjustable stops for the slide allow correct longitudinal positioning of the work. Ground ways for the slide are supported between the vertical arms of a U-shaped frame, which is bolted to T-slots on the machine platen, making it adjustable at right angles to the slide movement.

The operator removes a finished piece and places a new piece in the same work holder while the other piece is being tapped. He then moves the slide over as

*(TO PAGE 226—PLEASE)*



The HAMILTON MUEHLMATT Super Sensitive DRILLING MACHINE

SAVE ON SMALL DRILLS USE THE HAMILTON–MUEHLMATT

**PRECISION-BUILT FOR QUICK CHANGE SPEED CONTROL**

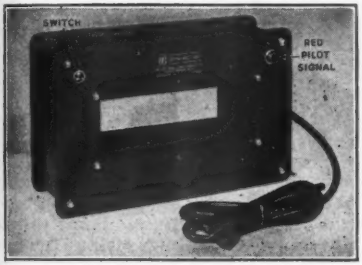
For small holes from .004" to 5/16" diameter such as are necessary on instrument, airplane, Diesel and other precision drilling operations.

*Write for Bulletin V*

THE HAMILTON TOOL CO.
Ninth and Hanover Streets,
HAMILTON OHIO

# AMC DEMAGNETIZER

**A Tool Room Necessity**




Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

**Available for either 115 V. or 220 V.**

*Write for full information.*

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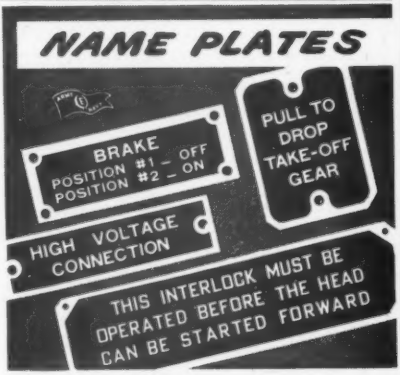
1619 Madison Ave., S. E., Grand Rapids, Mich.

# NAME PLATES


BRAKE
POSITION #1 – OFF
POSITION #2 – ON
PULL TO DROP TAKE-OFF GEAR
HIGH VOLTAGE CONNECTION
THIS INTERLOCK MUST BE OPERATED BEFORE THE HEAD CAN BE STARTED FORWARD

*Modern Messengers in*

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**A complete inspection department on wheels, to check parts right at the machine or bench. Errors are caught where they start and hundreds of dollars in wasted man hours and material are saved.**

**The unit consists of an 83-piece set of DoAll Gage Blocks, 20 auxiliary instruments, surface plate, Metron Comparator Gage, a file for records, desk space and collapsible seat. Occupies only 24 x 42″ floor space.**

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Manufacturers of DoAll Contour Machines and Surface Grinders. Offices in Principal Cities

1303 S. Washington Ave., Minneapolis 4, Minn.


## New Mandrel Locks Automatically; Requires No Adjustment

The Young roller clutch expansion mandrel, a self contained production unit, which maintains concentricity in low tenths for the entire length of the work and locks automatically by simply placing the work on it, is announced by the Young Arbor Company, 3257 Bradford Road, Cleveland Heights 18, Ohio.

Concentricity is maintained because expansion is uniform from front to rear, so that both ends of the work are equally

concentric. The mandrel requires no adjustment and cannot be sprung or distorted under normal use. Work will not slip or jam. Heavy cutting pressure merely results in tighter holding—work cut under severe pressure releases as easily as under a de-burring operation. The mandrels will absorb several thousandths in bore variation; their tendency to take up their own wear assures accurate work for long periods.

The Young Mandrel can be used for any machining operation. It may be used for de-burring and polishing as well as for turning or grinding. Rugged in construction with all parts properly heat treated, and simple in design, the mandrel is now used in high production of bearings.

*INFORM-A-GRAM KEY No. B52-P*

*(CONTINUED FROM PAGE 224)*

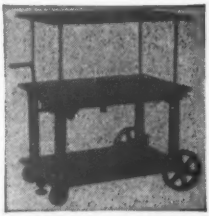
soon as the tap clears the finished piece. A slight pressure of the operator's hand maintains the slide against the stop, insuring accurate centering of the work. In this way the machine operates on a continuous repeat cycle, reducing floor to floor time to less than 10 seconds per piece.

*INFORM-A-GRAM KEY No. 134-P*

*Save Man-Power . . . Save Time . . . Save Costs*

**PORTELVATOR** *(Portable Elevating Table)*

Let skilled men do the special work . . . PORTELVATOR plus one "unskilled" man will do more in a "fetch and carry" way than a gang of men. Also ideal for overhanging work or supporting table.



THE HAMILTON TOOL CO.
Ninth and Hanover Streets,
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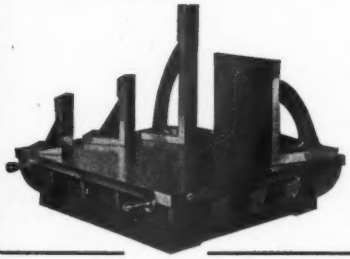
Capacity to 20 tons

**MILWAUKEE**
***Surface Plates***



A full line of surface plates, angles and box parallels. Standard plate sizes from 8″x 8″ to 48″x 96″, larger sizes with or without legs. Plates are finish-planed and scraped to insure a very accurate surface.

*Write for details*

**J. C. BUSCH CO.**
*Engineers & Machinists Since 1907*
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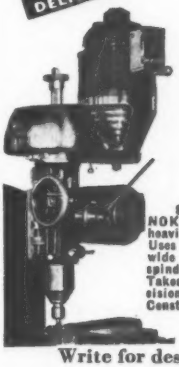
**MILLING - DRILLING - BORING ATTACHMENT** for Heavy Duty Operations

PROMPT DELIVERY



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Large Quill
4″ Travel
(counter balanced, hardened and ground)
6 SPEEDS
250-3000 RPM
Lever and Worm Feeds
½ H. P. Motor

Specially engineered by RUSNOK to meet the demand for heavier duty end mill operations. Uses many types of cutters on a wide range of work. Large size spindle (No. 9 B & S taper). Takes ⅛″ to ¾″ end mills. Precision Engineered and Ruggedly Constructed Throughout.

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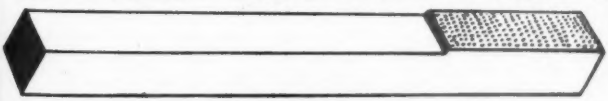

For ¼″ wide, 1 1/16″ long and approximately 1/16″ deep. $27.00 for ¾″ wide, with same specifications. Grits: Fine, Medium and Coarse: X Fine: X Coarse. Special shapes made to your specifications.

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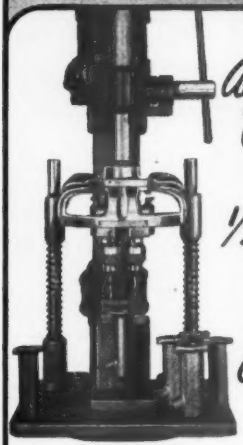
# TWO SPINDLE *Adjustable* DRILL HEADS

**Drill Two Holes At Once**



✓ *Adjustable Centers from 1/2" to 6"*

✓ *Drill Capacity 0 to 5/8"*

**Sleeve and overarm types ... in several sizes. Will double output of any single spindle drill press.**

**Quickly adjusted to desired drill centers from 1/2" to 6".**

*Send for bulletin*

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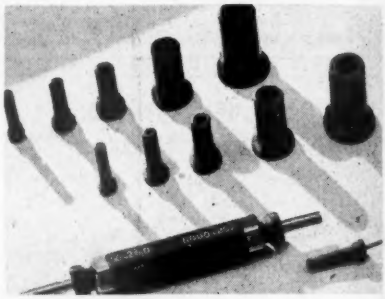
## Plastic Collets Lengthen Gage Life

Red and black collets of Tenite plastic, tapered and slotted to fit standard plug gage handles have increased the life of the gaging surfaces, according to Turner Gauge Grinding Co., 2625 Hilton Road, Ferndale, Mich. Collets of Tenite do not scratch or burr the gaging surfaces and most of the gage's length can be used.



As the "go" and "no go" ends are worn beyond allowable tolerances, they are cut off and the new ends are ready for gaging. Quick identification is assured by the use of red collets on the "no go" members.

The shoulder of the collet is notched for an end wrench to facilitate resetting; the slot takes up the slack in the locked position. Two shallow flat surfaces on the taper provide for dimensional adjustment under pressure.

The Turner Company turns the collets from rod stock which is extruded by Detroit Macoid Corp. of Detroit. The handles of these gages, molded by Federal Tool Corp. of Chicago, are also made of Tenite. The Turner gages are much lighter in weight than all steel gages and enable inspectors to make quicker, more accurate inspections. Tenite, a cellulose acetate material available in injection, compression and extrusion molding compounds, is a product of Tennessee Eastman Corp., Kingsport, Tenn.

*INFORM-A-GRAM KEY No. 695-P*

★

The outstanding war production record of W. H. Nichols & Sons, Waltham, Mass., has once again been recognized by the second renewal of the E award.

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Use artificial or natural gas or gasoline. Start without generating—"soldering heat in less than a minute." Schmidt "CONCEALED FLAME" Soldering Torches hold coppers steadily at any desired heat for continuous work. Very economical.

A moderate investment in Schmidt Equipment will step up production, reduce costs and increase profits. Send for circular.

for all Soldering Open Flame Work Brazing Branding Laboratory Use etc.

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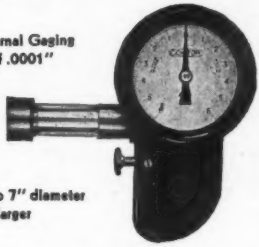
IDEAL FOR TRAINEES
PREFERRED BY EXPERTS

## COMTORPLUG

Precision Internal Gaging to fractions of .0001"



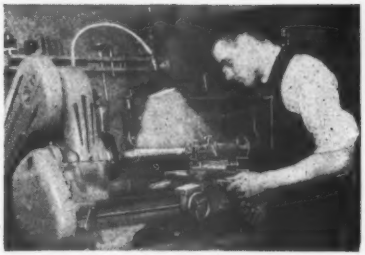
Sizes: ¼" to 7" diameter and larger

The precision of Comtorplug is independent of errors of human variation. With positive accuracy, it analyzes bores for size, front or back taper, out-of-round, bell mouth, etc., to fractions of .0001". Used at machine as well as by inspectors, it speeds and improves production of precision holes.

REQUEST BULLETIN 29

**The COMTOR Co.**
82 Rumford Ave. • Waltham, Mass.

## VIMCOLIGHT



### CANCELS OUT THE "SHADOW MENACE"

Glareless, clear, shadow-free VIMCOLIGHT conserves the EYE-POWER of machine tool operators. It helps to cut down spoilage and steps up production because it reduces eye fatigue. VIMCOLIGHT *spotlights the work* and is quickly adjustable from one position to another—inexpensive . . . easy to install . . . used as standard equipment on many leading machine tools.

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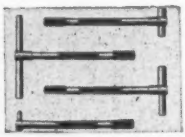
## BRAND GUARANTEED PRECISION TOOLS

### BRAND TELESCOPE GAGES

are precision ground—all parts subject to wear are hardened—ground to proper radius.



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| | | |
|---|---|---|
| AA | .125" to ½" | $2.10 |
| A | ½" to ¾" | 1.80 |
| B | ¾" to 1¼" | 2.10 |
| C | 1¼" to 2½" | 2.40 |

Set of 3 (A,B,C) w/case ..... 7.30

Set of 4 w/leatherette case .... 9.10

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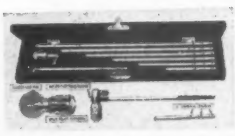
Highest accuracy—finest workmanship. Ask any man who owns one.



Made in 2 sets:

No. 4A 1½ to 12" with case and handle ....$11.00

No. 4B 1½ to 6" with case and handle .....$8.50

Immediate Delivery

Also M & L Precision Tapper—Gage Plates and Bars—Universal Angle Plates

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# ARBOR SPACERS

Measured by the number of times they can be used, De-Sta-Co Spacers are the lowest in cost of any spacers you can buy. Made of metal, they are not affected by oil or heat. Use these spacers for quick set-up of milling machine cutters and wherever low cost, accurate spacing is required.

Stock sizes .001″ to .125″ thick. Specials, any length, cut from bar stock, ground to decimal.

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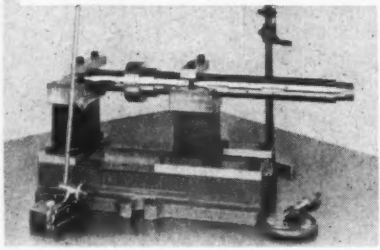
The most complete catalog of its kind. Lists 5000 different shapes, sizes and cuts of GROBET Precision Swiss Files. Ask also for catalog YM on files for filing machines.

Learn more about these Chrome Steel Files that have won a reputation for utmost precision and durability—since 1812.

**GROBET FILE CO. OF AMERICA, 421 Canal St., New York 13, N. Y.**

## Hartford V-Block Fixture



The Hartford V-Block Fixture is designed to make quick work of tough set-ups; its simplicity of design and construction makes it a favorite in tool rooms and production shops. The Fixture provides a practical and convenient method for locating and holding a wide variety of irregularly shaped work.

Ask for Circular VB-103.

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287 HOMESTEAD AVE. · HARTFORD CONN.

## The Newest in Cutters

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**CUTS—Wire and Rods up to 5/16 in. Rd.**
**CLIPS— Band iron up to 1/8 x 2 in.**
**MEASURES— Length of pieces.**

The lowest priced wire and band cutter on the market. Every Shop, big or small can use a WONDER CUTTER.

*Write today for further information and prices.*

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RussCo

PURPLE LAYOUT DOPE

*for* Tool . . . Die . . . Pattern or Template Layout and Check Lines on Castings. All lines show up Clear . . . Sharp . . . and well defined.

The best Layout Dope on the market { Gallons . . . . . $ 2.50 / Quarts . . . . . .90

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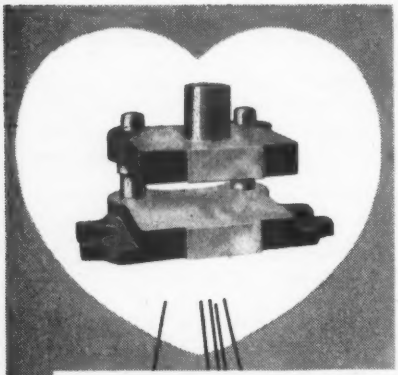

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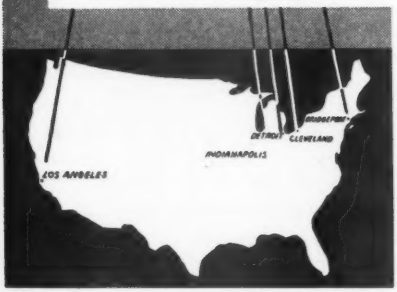
*For Special Die Sets and Bolster Plates.

For Complete Specifications ask for Catalog No. 9.

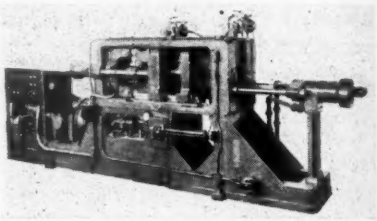


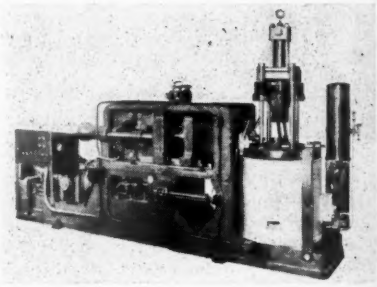

THE PRODUCTO MACHINE COMPANY

BRIDGEPORT 1, CONNECTICUT

## Lester-Phoenix Adds Two Die Casting Machines

Two new high-speed, high-pressure die casting machines, one for zinc, tin and lead alloys, the other for aluminum, brass and magnesium alloys, have been developed by the Lester Engineering Company for Lester-Phoenix, Inc., Dept. T, 2625 Church Ave., Cleveland 13, Ohio.





The machines are designed specifically for high production of small castings.

The zinc machine operates at 400 to 500 cycles per hour depending on size of casting and the rate of chilling. The metal is injected by a submerged plunger and gooseneck system. Pressures range from 2200 psi for a 4-pound casting to 1400 psi for a 6-pound casting.

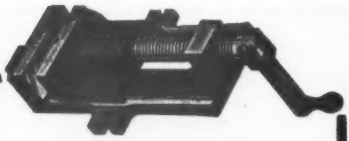
The aluminum machine employs a cold chamber injection system designed to deliver hot metal as slowly as chilling of the metal and thickness of the casting will permit, allowing for air escape.

Features of both machines include heavy-beam alloy steel frame with hydraulic double-toggle die locking mechanism, Acme screw die height adjustment, automatic die movement and metal injection cycles and automatic hydraulic ejector.

*INFORM-A-GRAM KEY No. 425-P*

## DESIGN ENGINEER

Georgia manufacturer needs man experienced in design and manufacture of jigs, fixtures and special production machinery and who is well acquainted with designing small commercial products of a mechanical nature. Graduate mechanical engineer preferred; or equivalent qualifications. Although plant now doing war work this is a postwar opportunity with long established company whose peace time products have international distribution. To arrange for personal interview write Box SP-9, Tool & Die Journal, 2460 Fairmount Blvd., Cleveland 6, Ohio, giving education, present and past jobs, detailed experience, age, salary expected and other information. Send snapshot if possible.



## YOST DRILL PRESS VISE

**This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.**

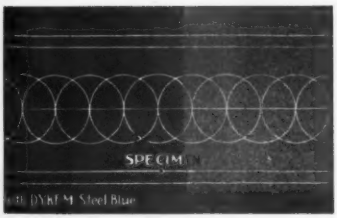
**Offered in two sizes.**

| Vise No. | Width of Jaw, Inches | Opens Inches | Weight Pounds |
|---|---|---|---|
| 1D | 3½ | 3½ | 12¾ |
| 2D | 5 | 5½ | 23 |

**Do you need a vise of ANY type?**

***Write today for bulletins on the extensive Yost line***

**YOST MFG. COMPANY**
**1000 MAIN ST.**
**MEADVILLE, PENNSYLVANIA**




## DYKEM STEEL BLUE
## *STOPS LOSSES*
## making dies & templates

Simply brush on; ready for the layout in a few minutes. The dark blue background makes the layout lines show up in a sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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## HY-SPEED SAW

**SAWS and FILES**
**Metals • Woods**
**Plastics**

- Fits any ¼" Electric Drill, Air Drill or Flexible Shaft.
- Chucks in Drill Chuck or Collet.
- Uses Ordinary Hack Saw Blades and Standard ¼" Shank Machine Files.
- Easily Used in Difficult Places.

All rotating parts are Ball Bearing and run in oil — no gears — no cams — always smooth running. Saw chuck holds firmly and aligns saw perfectly. A WYCO Guaranteed Tool. Send for Catalog on Complete Line of WYCO Profit Producing Tools and WYCO Flexible Shaft Equipment.

Complete, with extra saw blade and ¼" round machine file... **$35.00**

DISTRIBUTED ONLY THRU JOBBERS

**WYZENBEEK & STAFF, INC.**
838 West Hubbard Street Chicago 22, Ill.

**STA-KOOL**
**DIAMOND DRESSER**

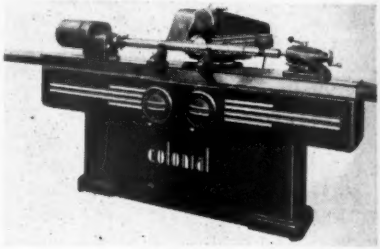
This new, patented diamond tool holder provides a fast, accurate method of meeting every requirement in dressing and truing operations. Equipped with internal coolant ducts for wet grinding, and external cooling fins for dry grinding, metal setting as well as stone are kept at safe operating temperatures, eliminating diamond breakage, due to overheating. Thus, tool life is increased, resulting in savings from 30 to 50%.

Catalog on request.

J. K. SMIT & SONS
157 Chambers St. New York 7, N.Y.


## New Colonial Broach Sharpener

A new broach sharpener, Model CS2, designed to sharpen round and flat broaches and providing for the increased sizes of broaches is announced by Colonial Broach Company Dept. T, Box 37, Harper Station, Detroit 13, Mich. Virtually any broach, including spline and serrated types; and sizes from the smallest up to broaches seven feet long and a maximum diameter of six inches (eight




inch maximum width for flat broaches), can be sharpened on the CS2.

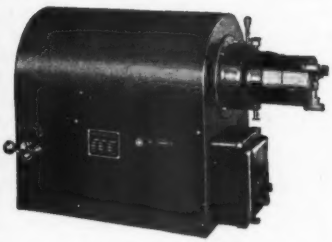
The lightweight alloy construction of the sliding head—about one-third that of equivalent iron or steel—takes into account the increasing number of women operators in sharpening tools. The head is supported and guided on by full anti-friction double-row rollers. To insure maintenance of this ease of operation for the life of the machine all anti-friction bearings are sealed.

Change-over from round to flat broaches is accomplished quickly and conveniently without special tools. Universal positioning and movement of the grinding wheel are obtained by a vertical column, a cross slide mounted on a graduated cross slide support and a graduated wheel head mounting. Headstocks with reduction gearing to give spindle speeds of 200 and 400 rpm for cylindrical broach sharpening are provided. Coil spring cushioned adjustable stops on the cross slide guard against shock at the end of the stroke when sharpening flat broaches.

The Colonial dual-ratio micrometer hand wheels which control identical steps per tooth to ten-thousandths are available at slightly extra cost.

*INFORM-A-GRAM KEY No. 26-P*

## Schauer Speed Lathes



**VARIABLE SPEEDS**

400 to 4800 R. P. M.

for efficiently polishing, lapping, deburring, and finishing small metal and plastic parts.

*Write for Catalog 440*

**SCHAUER MACHINE COMPANY**

2076 Reading Rd., Cincinnati 2, Ohio

## "ROCKWELL" HARDNESS TESTER

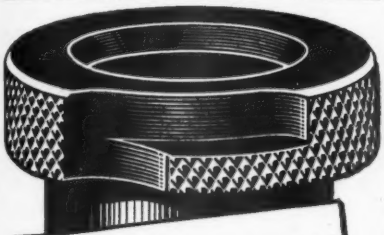
*Immediate Shipment*

The New "J" Model

383 Concord Ave. New York 54, N. Y.

**WILSON** MECHANICAL INSTRUMENT CO. INC.

Associate Company of American Chain & Cable Company, Inc.



**QUICK DELIVERY**

Write for Specification Sheets and Prices . . .

**COLONIAL BUSHINGS, Inc.**

145 Jos. Campau St., Detroit

**COLONIAL**

**DRILL JIG BUSHINGS**

## Miccro Supreme IMPROVED LAY-OUT-DYE

FOR TOOL, DIE, PATTERN OR TEMPLATE LAYOUT ON METAL

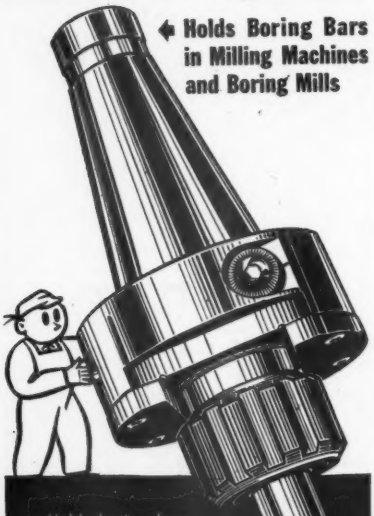
LOW IN PRICE

**MICHIGAN CHROME & CHEMICAL COMPANY**

6350 E. Jefferson Ave. • Detroit 7, Mich.

Dr. Paul Edgar Williams has joined the Owens-Corning Fiberglas Corporation, Toledo, Ohio, as director of education. Dr. Williams leaves the deanship of Fenn College, Cleveland, to accept this new post.


**ANNOUNCING! The new Universal Boring Chuck**



← Holds Boring Bars in Milling Machines and Boring Mills

Holds boring bars rigidly. Offset adjusting screw allows bar to be advanced or receded to suit work. Anti-backlash arrangement insures extreme accuracy. Two sizes, for bars ⅜" to 1" with milling machine taper or Morse taper shanks. Write for catalog.

Army Navy "E" Flag, Two Stars

Fighter Plane Given by employees

20% Employees Bond deduction

**UNIVERSAL ENGINEERING CO.**

FRANKENMUTH, MICHIGAN


**ARTHUR J. MILLER** has been elected president of the Chicago Wheel & Manufacturing Co., producers of mounted wheels, grinding wheels and allied abrasive products. He replaces his father, the late Henry E. Miller founder of the company. Arthur Miller joined the company in 1915 and in 1926 was elected treasurer. He is responsible for many company developments including industrial type mounted wheels, high speed electric grinders and various abrasive industry processes. Associated with Mr. Miller are Irving Danielson, vice-president; A. J. Miller, Jr., treasurer and Arthur T. Dalton, secretary and sales manager.

**VICTOR F. J. TLACK**, pioneer developer of cobalt chromium steels and tool steel jobbing executive, has been appointed consultant and special representative of the sales department of Latrobe Electric Steel Co., Latrobe, Pa. He will make his headquarters at the company's Cleveland office. Mr. Tlack until recently served as president of Darwin & Milner, Inc., tool steel jobbers of Cleveland, Ohio. He made important contributions to the tool steel industry thru his research and developments of cobalt chromium steels, which have proved so successful for dies, tools and airplane engine valves.

**ARTHUR M. MORGAN**, since 1942 vice-president in charge of sales of Latrobe Electric Steel Co., of Latrobe, Pa., has been elected a director of that company, the board of directors announces. Nationally prominent in tool steel circles, Mr. Morgan has been associated with the Latrobe Electric Steel Co. for the past 15 years. Prior to his election to the vice-presidency he served as district manager in the Detroit area from 1932 to 1942.

HY-TEN

AISI SAE

NE

*Alloy Steels For Victory*

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

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GOTTSCHO INDENTA
Indents steel, metal, and plastic parts in rapid succession.

*Write for Literature*

*Instantaneous adjustment for thickness variations. No experienced operator necessary*

MARKING EQUIPMENT
ADOLPH GOTTSCHO, INC.
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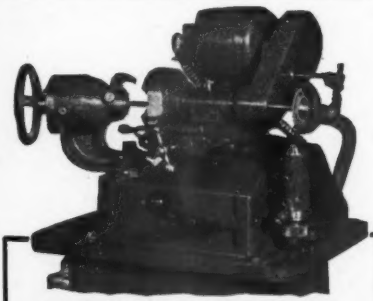
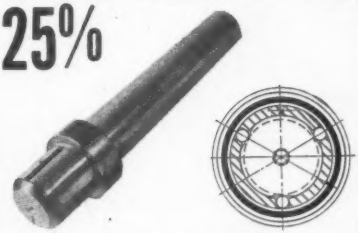


**HYBCO TAP GRINDERS**
*Sharpen ALL The Vital Points*
CHAMFER ● FLUTES ● SPIRAL POINT
- *Fast—easy to operate.*
- *Complete—no parts to change.*
- *Capacities—#2 to 1½" hand taps—with interchangeable heads.*

HEADS ONLY AVAILABLE FOR USE ON UNIVERSAL TOOL & CUTTER GRINDERS
*Write for Circular TGH*

HENRY P. BOGGIS & CO.
1277 W. Third St., Cleveland, O.

25%



**Young Mandrel**
**"Roller Clutch Expansion"**

Boost your high production 25%. This self contained unit requires no wrenches, "C" washers or power operated draw bars. Work locks automatically when placed on the mandrel. Work will not slip or jam. Young Mandrels require no adjustments.

Concentricity is maintained in LOW TENTHS for the entire length of the work.

Use Young Mandrels for any machining operation. Sizes 1" to 4", any desired mounting.

Send drawings of part and mandrel in use. Good delivery schedules.

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WORK
BETTER
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Keep hands
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CARL ZEISS INC.
2¼x HEADBAND MAGNIFIER

Use of both eyes reveals true depth of details. Magnification of 2¼x. Free working distance, 8" to 10", permitting unhindered use of hands. By just lifting your head, your eyes are free for any other activity. Eyeglasses may be worn while using. Highest optical quality. Eyeshade of Tenite —practically unbreakable. *Write for leaflet.*

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NEW UNIVERSAL
GREENFIELD
GRINDER SPEEDS
TOOL AND
CUTTER GRINDING

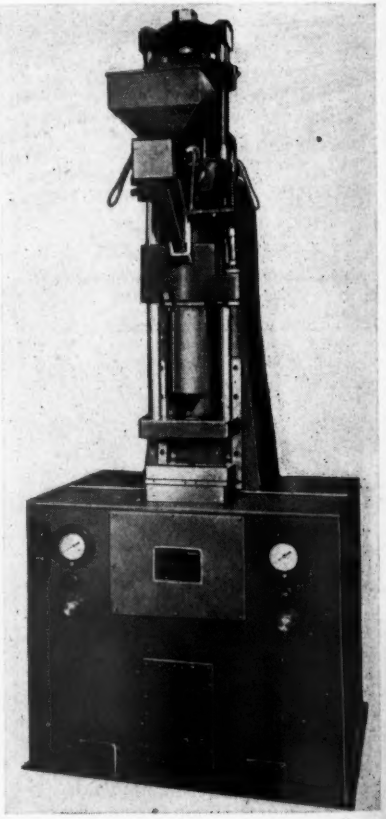
★

Spindle design of the new and improved GREENFIELD Wheel Head incorporates generous bearing areas — scraped to fit and thoroughly run in. Quickly and easily set up attachments provide tool-room versatility for grinding formed cutters, taper and rose reamers, flat surfaces and compound angles. Send for detailed and illustrated job application bulletin.

PRODUCTION MACHINE CO.
GREENFIELD, MASS.

## Vertical Injection Molding Machine

Two new vertical injection molding machines, especially adaptable for operations requiring inserts or long leads in the finished parts, are announced by The Watson-Stillman Co., Dept. D, Roselle, N. J. Available in 2 oz. and 4 oz. capacities, the new vertical molding machines embody new and exclusive features that assure speedy production, low costs and



precision results. Designed for thermoplastic materials, the units are adaptable for molding thermosetting materials.

The machine bed and C-frame is a single piece welded steel structure hous-

*(TO PAGE 239—PLEASE)*

# DUPLEX M-6
## BAND AND DISC GRINDER

**The latest in pedestal type grinders. Actually two machines in one! 14" disc for all rough work . . . 6 x 48" band for finishing. Precision-built to meet wartime production standards — quickly, economically!**

*Other styles and sizes in New Booklet on Finishing—Write Today*

**WALLS SALES CORP.**
97 Warren Street New York 7, N. Y.


*(CONTINUED FROM PAGE 238)*

ing the power unit and both electrical and hydraulic controls. The entire open front gives accessibility to molds and permits handling of molds with projecting inserts. A standard two-piece mold or a mold set-up with a single top die and two bottom dies can be used; the latter arrangement permits the operator to position inserts or leads in one mold while the other is in operation. Rate is approximately six cycles per minute.

The feed mechanism is operated through the upward motion of the ram and is self-compensating. Material can be injected at any desired pressure without affecting the clamping pressure. Foot operated ejection strippers for the dual bottom die setup or a center mechanical ejector for the single bottom mold assure positive ejection. Both manual and fully automatic control equipment is provided. Positive action safety devices eliminate operating hazards.

*INFORM-A-GRAM KEY No. B44-P*


# SAFETY
(Reg. Trade Mark)
## HEAVY BEVEL

## LETTERS and FIGURES

**"SAFETY" steel construction . . . Deeper impression . . . Will not spall, will not mushroom . . . For all types of marking . . . Any size character from 1/32" up . . . Immediate delivery.**

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SAFETY STEEL STAMPS
104 Jefferson St. Pittsburgh 13, Pa.

*Die & Tool Makers*

DESIGNERS AND MANUFACTURERS OF DIES • TOOLS • GAUGES • JIGS AND SPECIAL MACHINERY

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**No Finer Wrenches**

Drop Forged Carbon and Chrome-Vanadium open end and box socket wrenches, and Chrome-Vanadium Steel Detachable Sockets with drop forged Ratchets—over 100 types, all sizes.

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*"The Tool Holder People"*

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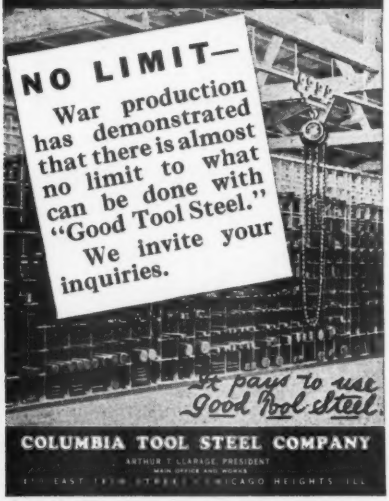
Eastern Warehouse & Sales: 199 Lafayette St., New York.

# Columbia
## TOOL STEEL

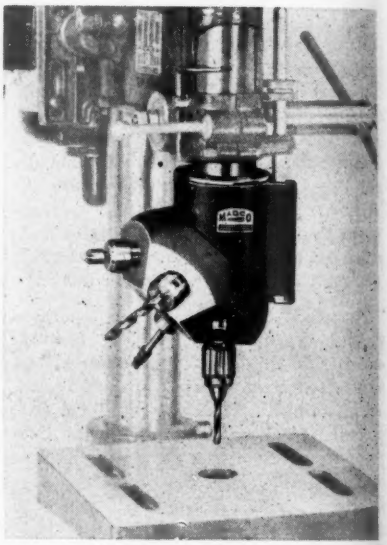

NO LIMIT—
War production has demonstrated that there is almost no limit to what can be done with "Good Tool Steel."
We invite your inquiries.
It pays to use Good Tool Steel.

**COLUMBIA TOOL STEEL COMPANY**

ARTHUR T. LLARAGE, PRESIDENT
MAIN OFFICE AND WORKS
[illegible] EAST [illegible] STREET, CHICAGO HEIGHTS, ILL.


## Drill Press Turret

This new turret attachment for small drill presses such as Atlas, Buffalo, Delta, Walker-Turner, etc., is a product of the Machine Development Co., Dept. TJ, 516 Fifth Ave., New York 18, N. Y. Called the MADCO Turret Head, it is designed to enable single spindle drill presses to be used for multiple spindle operations. The present model shown here carries six individual spindles, will take up to ⅜" diameter drills and can be used for tapping when reversible. It




is attached to the drill press quill by a collar and three set screws. A special driving mechanism is supplied with the turret.

In operation, the operator raises the drill press lever, turns the head to any station and lowers the lever as in normal drilling. A ball and detent arrangement indicates when the head is indexed and a special clutch automatically engages and aligns the spindle. The turret comes equipped with either six blank "screw chucks" for adapting to special tooling, or six adaptors for No. 1 Jacob chucks, or a combination. Available also are adaptors for Nos. 2 and 3 Jacob chucks, an automatic indexing depth stop, and an adaptor collar for a 17" Delta Press.

*INFORM-A-GRAM KEY No. B51-P*

## HAND POWER CUTTERS

FOR

FLAT BARS • RODS • ANGLES • WIRE ROPE

Made in three Sizes

Handy, Portable, Built for Service, Each Machine Is Thoroughly Tested Before Leaving Our Plant. All Parts are Interchangeable and are Carried in New York Stock.

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**T. H. LEWTHWAITE MACHINE CO.**

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HIGHEST QUALITY "ANCHOR" CHROME CLAD STEEL TAPE

LUFKIN

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TAPES • RULES • PRECISION TOOLS

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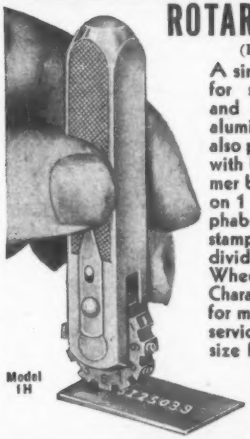
### ROTARY STAMP

(Patented)

A single wheel Stamp for stamping figures and letters on brass, aluminum or soft steel, also plastic and wood, with but a single hammer blow. All figures on 1 wheel, entire alphabet on 2. One stamp replaces 12 individual, hand stamps. Wheel of tool steel. Characters, engraved for maximum stamping service, furnished any size from 1/16" to 3/8". Also supplied with shank fo press.

Write for Bulletin TD-1H.



Model 1H

**NUMBERALL STAMP & TOOL CO.**

HUGUENOT PARK STATEN ISLAND 12, N. Y.

## TOOL ROOM FOREMAN WANTED

To assume responsibility for the designing and making of dies, tools, jigs, etc. He should be a qualified tool designer with successful experience of supervision and management of small tools and die department. Plant located in Northwestern Ohio. It has excellent and outstanding post-war opportunities in the electrical field. Write in full, personal information, qualifications, background, etc. All correspondence kept strictly confidential. Box B-9.

TOOL & DIE JOURNAL

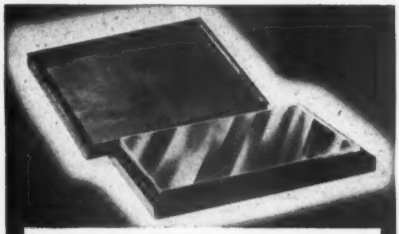
2460 Fairmount Blvd. Cleveland 6, Ohio

## Logan . . .

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

LOGAN ENGINEERING CO.

CHICAGO 30, ILLINOIS



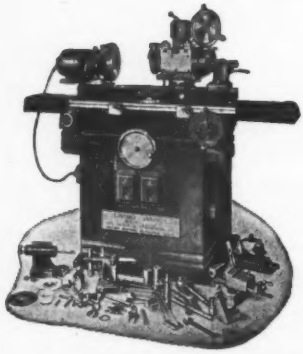
GLASS SURFACE PLATE

has been found to be —"remarkably flat, requiring the use of optical flats to detect 'waves'—it has good life—scratches break into the surface but do not affect the flatness of the plate—and the tendency of objects to wring to the plate, because of its highly polished surface, is overcome by its design."

WRITE for completely descriptive folder about the new Cadillac Glass Surface Plate. Available in sizes from 8"x8" to 18"x24" and in accuracies from .0002 to .0005. Prices range from $11 to $90, packed in an individual box, the top of which forms a protecting cover.

CADILLAC GLASS COMPANY

900 West Cermak Road • Chicago 8, Illinois



Grand Rapids No. 60 Universal Cutter & Tool Grinders feature cabinet base, ball bearing table and fixed table height, backed by 35 years of know how.

*Bulletin on request*

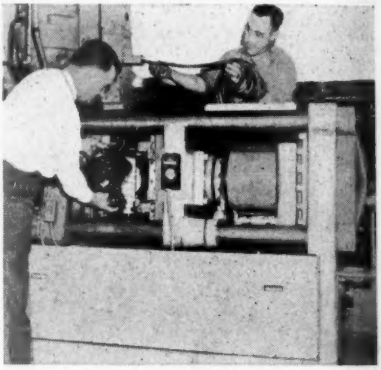
GALLMEYER & LIVINGSTON CO.

304 Straight Ave., SW

GRAND RAPIDS (4) MICHIGAN

## Continuous Injection and Extruding Machine

A continuous injection molding and extruding machine, said to be the first of its type, has been announced by Chrysler Corporation. In making the announcement F. M. Zeder, vice chairman of the Board, and in charge of all engineering for the corporation, states that the new machine, developed and extensively tested in the Chrysler Engineering Laboratories, has demonstrated that it can step up both size and volume of injected thermoplastic and thermosetting materials, thermosetting extruded materials and injection and extrusion of rubber and synthetic rubber parts.



Continuous injection is achieved by a worm screw built into a heating cylinder. Material is fed from a hopper into the heating cylinder where the turbulent action of the screw thoroughly mixes the material. The design of the screw forces the heated mix under high pressure (up to 22,000 psi) through a nozzle. Single or multiple cavity injection molds or extrusion die heads may be employed to give the machine a versatility new in the plastics field. Curing time is said to be cut approximately 93 percent.

An outstanding feature is the size of pieces or parts that can be injection molded. A plastic battery case using 138 ounces (eight pounds) of thermosetting material was produced in less than five minutes. This is more than three times

*(TO PAGE 244—PLEASE)*

## HARDNESS TESTING

has been done with the SCLEROSCOPE since 1907

•

**THE SHORE INSTRUMENT & MFG. CO., INC.**
9025 Van Wyck Avenue
Jamaica, N. Y.

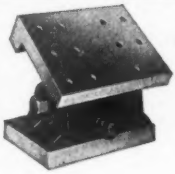
## Gusher
## COOLANT PUMPS

Sizes from 1/10 to 2 h. p. Pumping capacity up to 200 g.p.m. Many patented and exclusive features.

*Write for descriptive literature*

**The Ruthman Machinery Co.**
1808 Reading Rd., Cincinnati, Ohio

## McMahon Adjustable Angle Plates



Model "A" Adjustable Angle Plate with four ⅜" "T" Slots. Size, 3" x3"x3¾". *Price*, $14.40. Shipping weight, 5 lbs.

Model "D" Adjustable Angle Plate with 16, ⅜"x16 threads tapped holes. Size, 6" x 6" x 7½". *Price*, $42.00. - - - - Shipping weight, 45 lbs.

**FRANK McMAHON CO.** 142 S. June Street Dayton 3, Ohio

## 6 DAYS DELIVERY

For first shipment on accepted orders on

THREAD MILLING CUTTERS (Hobs)

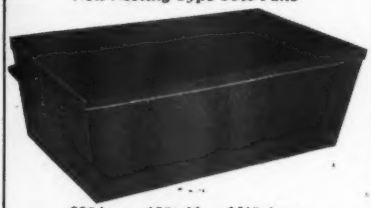
EXPANSION and RADIAL RELIEVED FORM CUTTERS (Regular or Interrupted tooth form)

CIRCULAR THREAD CHASERS

INVOLUTE SPUR GEAR CUTTERS 14½°; 20° & 25° P. A.

**U. S. MACHINE TOOL MFG. CORP.**
Clinton, Indiana - Phone 85

*New Nesting Type Tote Pans*



20" long x 12" wide x 6½" deep.
16 ga., drag holes and handles both ends.

**J. L. LUCAS & SON, INC.**
Bridgeport, Conn.

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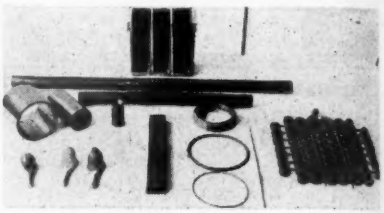

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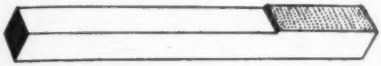

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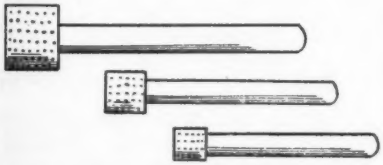

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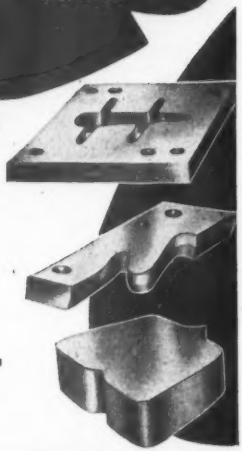

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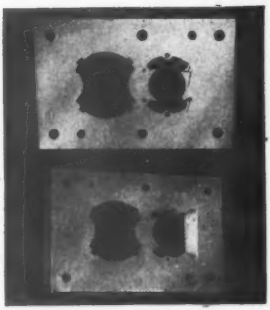

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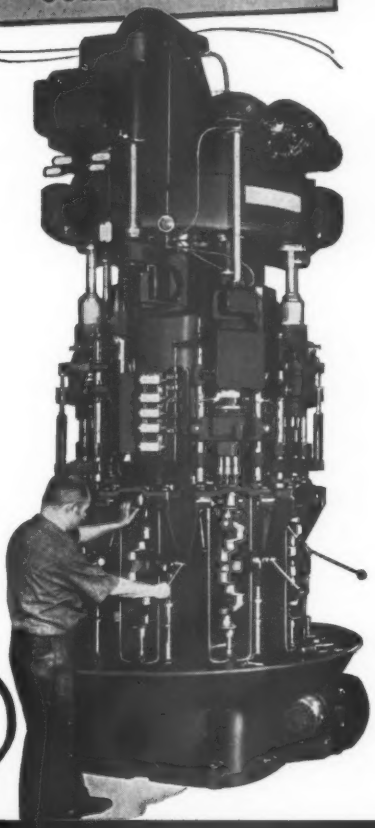

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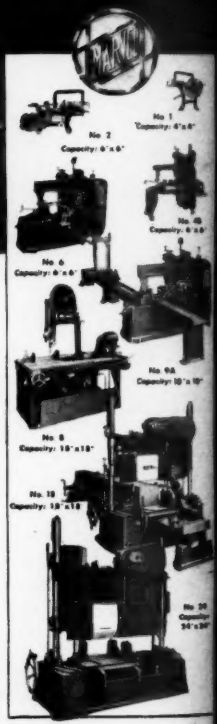
## Endless Rows of Tank Shoes from Saws that Never Stop




These six MARVEL No. 6A automatic Production Hack Saws, in the Louisville plant of the Service Welding and Machine Co., never stop except for necessary service—changing of blades; etc. Day after day on a 24 hour schedule they automatically cut 20 ft. sections of SAE 1020 Steel into multiple, 6¾" lengths. This *is* "continuous high speed metal sawing at low cost", *in fact*.

Each of these pieces welded to a "Z" shaped forging makes a "shoe" for an Army Tank.

Before the Service Welding and Machine Co. took this contract they investigated various types and methods of "high speed production sawing" and selected MARVEL Production Saws as the most able and certain to deliver and maintain rapid, accurate production at low cost.

Write for Catalog showing the complete MARVEL System of Metal Sawing.

**ARMSTRONG-BLUM MFG. CO.**

*"The Hack Saw People"*

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**MARVEL SAWS**